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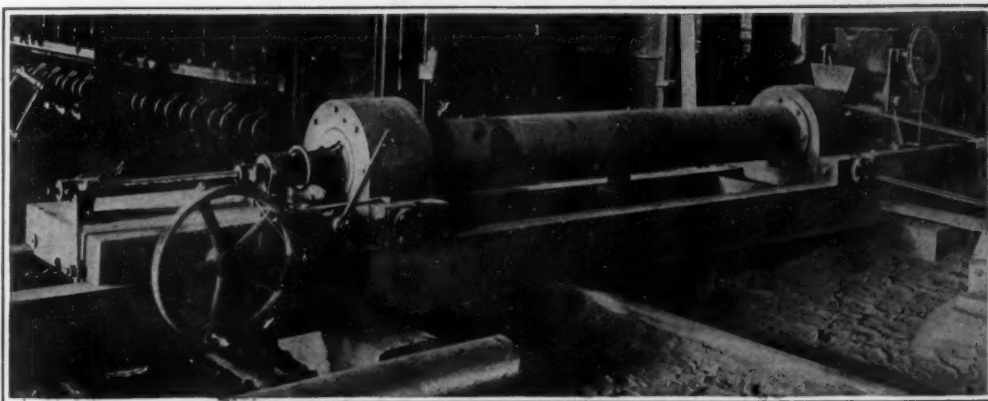
Casting Pipe Centrifugally

THE application of centrifugal force to the making of cast-iron pipe dates back to 1809, when the first patent was granted to one Anthony Eckhardt, of England; but the experiments had no favorable outcome, and were dropped. Subsequent patents were secured in one country or another in 1865, 1882, 1892, 1895, 1897, 1900, 1911, 1912 and 1913; but none of the attempts thus revealed has been a commercial success. The majority of the processes consisted in lining the molds with sand, and there were serious mechanical complications in the use of a rotary mold. Attempts to form castings in permanent molds met with disappointment. The metal did not spread evenly in the mold, which consisted of a cope and a drag. Another difficulty lay in the extraction of the casting from the mold. It was necessary to stop the machine, remove bolts, etc., in order to accomplish this, and the time thus consumed had a bad effect upon the quality of the metal in the finished pipe.

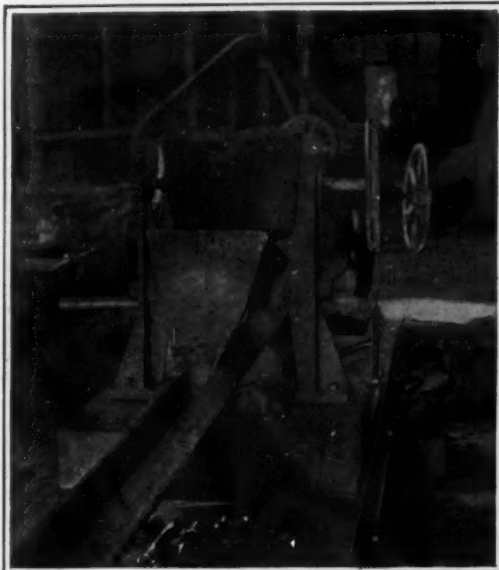
A machine has now been invented, and operated successfully on a commercial basis in Brazil for nearly three years, which makes cast-iron pipe of all sizes. Briefly, the metal is introduced, in carefully regulated quantities, into a rapidly revolving cylinder, where by the centrifugal force exerted it is spread uniformly over the surface of the mold. After a few seconds the pipe is withdrawn, white hot, from the other end of the machine, and, except for the tarring, is subjected to no further treatment. Uniformity in section, speed in production, facility in handling and strength of metal are among the claims made for the new process.

Mr. D. S. de Lavaud, the engineer who was responsible for the undertaking, describes in interesting fashion the initial disappointments, which were numerous and severe. A perfect pipe seemed impossible; the metal would not spread evenly, and the pipe obtained was as brittle as glass, with many structural defects. It was finally decided to use a trough for introducing the metal inside the mold, and the results were then somewhat more satisfactory. The first machine was constructed to produce four-inch pipe about three feet long; but realizing the special difficulties in connection with such a small article, the workers substituted a second machine for six-inch pipe seven feet in length, embodying all the lessons taught by experimenting with the preceding outfit.

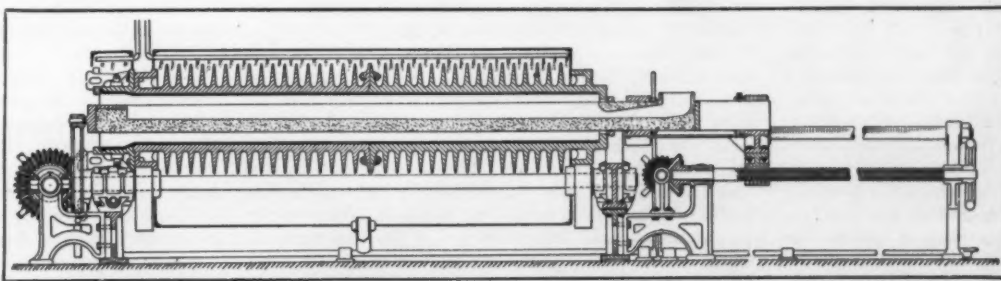
Since it was an open question what would happen upon casting 100 kilograms (220 pounds) of metal under such conditions, the experimenters did not get the conditions right the first time. They heated the mold to about 600 degrees Fahrenheit, only to find that the pipe thus cast could not be extracted, because it required three minutes for the casting to shrink sufficiently in diameter, and it was then like glass, breaking easily under a



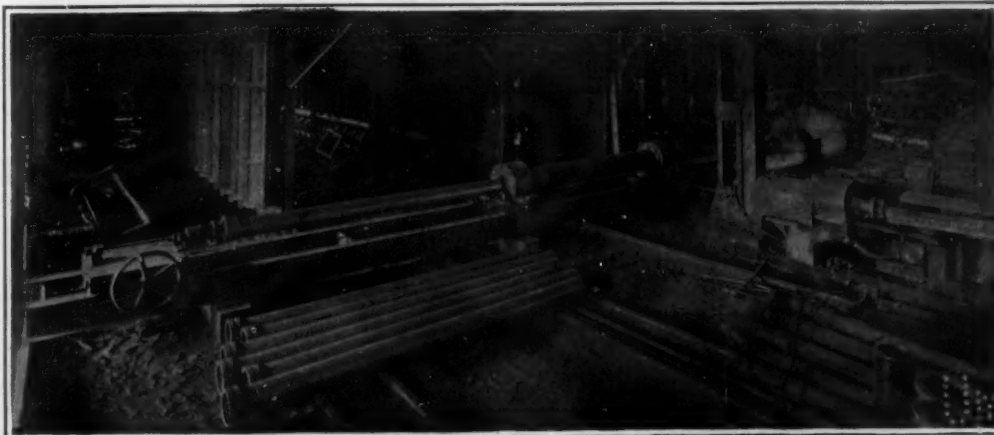
The outfit for making cast-iron pipe by centrifugal action



Trough through which the centrifugal pipe is poured



Sectional view of the centrifugal pipe machine, showing particularly the arrangement of cooling ribs



A pipe section being withdrawn from the centrifugal machine

hammer. Sometimes the pipe actually defied all efforts at extraction from the mold. Further trials were made with iron heated to a higher temperature, and containing at least 2.5 per cent silicon. This time the mold was not heated, and success attended the pouring; the pipe could be extracted almost immediately—within five or ten seconds, in fact. It could not be broken with a hammer, it was soft, and easily machined. Experiment was then made with the mold heated to various temperatures, from 300 de-

grees up, and in every case extraction was difficult and the pipe was too hard for complete satisfaction.

All this seemed to warrant the conclusion that the necessary conditions for success were a permanent, rotary, cold mold; immediate extraction of the pipe after solidification; the use of very hot iron; and a silicon content up to the figure named. The success attending the use of cold molds may seem strange at first blush; but the metal is distributed in the interior of the mold over its entire length, and it is thus that the cold mold does not interfere with the even distribution of the metal.

According to Mr. de Lavaud's theory, the metal falling in the cold mold will congeal at once, forming a solidified crust which creates a centripetal force; the pipe then detaches itself from the surface of the mold, and the space between mold and pipe becomes a sort of insulating chamber, in which the air, being at high temperature, graduates the solidifying of the still molten mass and at the same time anneals the crust first formed. When the mold is at a temperature of five or six hundred degrees the crust will not form and the whole mass of iron cools uniformly with very slow contraction and consequent difficulty in removal.

The final modification, as the result of exhaustive experiment in Brazil, was the construction of a machine provided with a permanent rotary mold with ribs for cooling purposes, the cooling medium being an active water circulation. In this machine it was found quite practicable to run off pipe at the rate of ten per hour.

As a result of all this the construction of several machines was decided upon, two with interchangeable mold for pipes from six to twelve inches in diameter and ten feet long, and two with interchangeable molds for 12- to 40-inch pipe in 14-foot lengths. The first of these machines was finished late in December, 1915, and the first pipes cast the next month; all were reported perfect. Pipes with wall thicknesses of $\frac{1}{4}$ -, $\frac{1}{2}$ - and $\frac{3}{4}$ -inch were made with satisfactory results. The machines making pipe up to twelve inches were used in connection with cupolas, while for the larger sizes metal direct from the blast furnace was employed. It has been observed that the larger the diameter of the pipe, the easier the process of casting.

Some interesting tests have been made upon various

(Concluded on page 117)

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Protection for the Port of New York

THE question of the protection of the Port of New York from damage by fire or explosives in the hands of enemy aliens is most threatening and far more serious than the general public believes. The recent order establishing a barred zone and requiring Treasury Department permits to enter such zones is reducing the danger to vessels very materially from the shore side. We are informed on creditable authority that previous to that order, in nine cases out of ten, one could gain admission to piers, and to vessels lying at piers, by subterfuge and without showing proper credentials. One informant states that he had done this on many occasions, in some instances by "flashing a tin," that is, a badge or something to resemble a badge, at which the civilian watchman merely glanced. Sometimes he merely said that he was from some Government Department or wished to see some officer on a vessel. In places where the patrol were Marines, Naval Reserves, or Soldiers, it was necessary to show proper credentials before he was allowed to pass. If there was any question of his credentials not being in proper shape, he was held and the Corporal of the Guard was called to examine him.

This informant further stated that a large percentage of the civilian watchmen on the railroad and other piers might be found asleep at night. Since the establishment of the barred zone these conditions have been changed, and today the greatest menace is by water. Many small motor boats operate in the waters of New York Harbor at night, and without lights. It would be a very simple matter for any one of these boats, or similar boats, to take enemy aliens to slips, piers, and vessels, on which are much-needed supplies for our own forces or for the Allies, and set fire to them, or place there bombs of various kinds, and then make their escape undetected.

Boats are not supposed to operate in the navigable waters except with licenses from the Naval authorities; but many motor boats do so operate. This fact has been demonstrated and it shows the facility with which unauthorized persons, enemy aliens, as well as others, can go about on the waters of the harbor for illicit purposes and visit piers, vessels, barges, and lighters, without being arrested.

It is an unfortunate fact that the municipal police find much difficulty in securing a conviction before a minor magistrate. Unless the municipal police establish an absolutely clear case against the persons they have arrested, the minor magistrates permit the offenders to go free. This state of affairs may be necessary under our laws in time of peace, when the criminal is given the benefit of every safeguard and we act on the principle, "Better let nine guilty men escape than punish one innocent man." In the present state of war, the interests of the Nation must predominate, and unauthorized persons must absolutely be prevented from entering restricted areas. Any one approaching piers, storehouses, loaded barges, etc., at night, in a boat without lights, or on foot, should at once be justly presumed to be a criminal and a United States sentry be justified in firing upon him.

The civil law is always slow. In the present emergency, where the lives of so many of our people in the Army and the Navy abroad, as well as the lives of citizens here, depend upon our supplies of various kinds being safeguarded and got to the proper destination, it is of the utmost importance that, not only this Harbor, but all of our other important seaports should be properly protected. In order to do this, it seems evident that the only sure method is to declare martial law to cover certain zones, piers, storehouses, etc., and the waters of the harbors of our important seaports.

Martial law can act in a much more summary and efficient manner than civil law. Most of the supervision necessary will be on the waters, and it is believed that the Navy Department is in the best position to administer or have control of these areas.

At present, the matter apparently lies between the Department of Justice and the Municipal Police. If martial law is declared and the Navy Department put in charge, it is suggested that there should be formed a patrol service for the inner harbor, which should be made up partly of some of the New York Police or former policemen of the Harbor Patrol Service, since these men are thoroughly familiar with the waters and the general conditions. They could be readily enrolled in the Naval Reserve, in proper grades and ratings, and assigned to their duties under a Naval Officer (Reserve) especially qualified for this work, serving under the command of the Commandant of the District.

The Harbor Police of the Port of New York are excellent men, well qualified for their work; but the police and the red tape of civil law are too slow, too uncertain; and many criminals escape. Again, civil law cannot act until the crime is committed. Martial law under the Navy can and will prevent the enemy acts being committed.

"Garabed"

WE had originally intended not to dignify the doings of Mr. Garabed T. K. Giragossian, of Boston, by discussing them on this page—for "dignify," we hope, is the right word. We have received so many inquiries from our readers, however, and governmental attention to Mr. Giragossian has reached such a point, that we feel constrained to reverse this decision.

This inventor claims to have discovered a way to utilize, without burning of fuel or other expenditure of labor or material, what he calls "free energy." He proposes that the Government investigate the matter, at his expense, through fully competent and properly accredited scientists; and he wishes, if their report be favorable, to assign to the United States the rights of use in his invention, to the end that we may employ it to bring about the end of the war.

Mr. Giragossian has received more attention than is usually accorded to those who bring forward schemes for ending the war at seven o'clock tomorrow morning. In the first place, he came out of the intellectual metropolis of the universe armed with letters from three men who may well be described as prominent citizens of Boston, since one of them is director of music in the public schools there, another president of the board of trustees of the public library, and the third a mysterious combination of artist and financier and draftsman who has supplied the sinews of war to the good Armenian and made his working drawings for him without learning anything about his working details. These three gentlemen spoke so highly of Mr. Giragossian's "integrity and intelligence" that a Committee of the House of Representatives found it necessary to refer twice in one brief paragraph to these sterling characteristics. And even before this, the inventor's flow of language had so captivated another chairman that he stated: "We were all impressed with his sincerity and honesty. . . . He did not tell us what he had, and he would not illustrate his invention to a subcommittee of five, but we were all impressed with his honesty and level-headedness."

In other words, Mr. Giragossian came to Washington, he saw, and, with his silver-tongued eloquence, he conquered. So runs the official version. But as a matter of fact, confronted with a proposition like this, there was really but one thing for Congress to do. No matter how absurd it seems on its face, no matter what its source, such an offer cannot be flouted. We are entitled to protect ourselves against a man who tries to sell us something; but when he offers to let us decide whether we want what he has, and, if we do, to give it to us—well, there can be no argument. We have nothing to lose and everything to gain, and we simply have to pay attention. That, indeed, is what we have done; at the present moment a joint resolution of the two bodies of Congress, enacted into law Mr. Giragossian's proposals, is somewhere along the legislative main line, and will presumably reach in due course the terminus at which the president wipes his pen and attaches his signature. Congress would have done well to have apologized less profusely for this action, for apology was not called for.

Let it be emphasized again and again, however, that this is no way binds the United States to Mr. Giragossian, and above all, that it in no way constitutes official endorsement or acceptance or approval of his claims. Indeed, what these are is absolutely not known, for the good and sufficient reason that Mr. Giragossian won't tell. In this he is hardly to blame; for if we had a valid invention which would do what he claims his will do, we should probably behave just about as he has behaved. But it is always given to discuss possibilities and probabilities; and we may therefore proceed to this phase of the matter.

The worthy Armenian, in what little he has said about his invention, as distinguished from the reams of stuff he has had to say about himself, has seemingly attempted to give the impression that he has hit upon some scheme for commercial utilization of the cosmic forces, for harnessing the power that makes the world go 'round

and the heavenly bodies move in their paths. "Free energy" could mean this, and we fail to see what else it could mean. But until the protégé of Boston's distinguished public servants condescends to tell us, in intelligible terms, just what he proposes to do, we can not discuss his scheme adequately. We can, however, point out that almost certainly he is on a par, as far as proper development of working details is concerned, with another Bostonian—or can it be that he himself is the one?—who was anonymously reported to us several years ago as prepared to retard the earth in its rotation and impound the energy thus released.

Of course, human labor and the burning of fuel and the various other performances which cost money are not a prerequisite to the manifestation of power. Gravity and atomic forces and electricity and magnetism and the tremendous energy of the sun's radiation act all the time, regardless of our will or our works. But when we try to direct one of these forces we have always heretofore had to do so by application of another force, put into play by our will and works in a way that does cost us labor and material. If Mr. Giragossian, with his non-descript collection of character witnesses, as lacking in scientific standing as their protégé, wants us to believe that he has found an escape from this stern necessity—well, he asks too much.

Conservation of the Nation's Water Power

THE long-drawn-out struggle to prevent the Nation's water power from falling under individual control, and preserve it for the common use and benefit of the Nation as a whole, seems about to end in a complete victory for the advocates of national as against individual control. The Administration Water Power Bill, now before Congress, opens the way to preserve for the people of the United States one of their most valuable natural assets; for it is estimated that some fifty million water horse-power is affected by this measure.

The bill in question, which was formulated under the direction of the Secretary of Agriculture, the Secretary of War, and the Secretary of the Interior, was submitted to the President for his approval, and has been put forward as an Administration measure. It deals with water power in National Forests, Public lands, Indian lands and navigable streams. The bill is under consideration by a special Committee of the House, which has been created for that purpose. That it is an admirable measure, drawn with thorough knowledge and unusual skill will be evident if we bear in mind that it is based upon the following essential principles:

First, the thing to do with water power is to develop it. Whatever retards or restricts the development of public water powers, on terms fair to the public, is against public policy and therefore hostile to the general welfare.

Second, water power is public property. The sites where it is produced should always be held in public hands; for only in this way can effective control in the general interest be secured.

Third, where public development is not desired, the right to use water power sites should be leased for periods long enough to permit of sound, attractive and profitable investment. It is considered that a lease of fifty years should be sufficient, and that when these leases expire all rights should return to the public.

Fourth, in order to protect the consumer against overburdensome charges, rates and service should be regulated by Federal authority wherever State or local authorities fail to provide for such regulation.

Fifth, reasonably prompt and complete development and continuous operation, subject to market conditions, should be required. As matters now stand millions of water horse-power are held out of use merely for speculative purposes.

The Administration Water Power Bill will first come before the House of Representatives, where, if previous experience is any guide to what will happen, an effort will be made to amend it in the interest of the present advocates of water power private ownership. If that should fail, the opponents of the bill will probably endeavor to have the indefensible provisions of the old Shields Bill substituted, in the Senate, for the Administration Bill. If the Administration should win out in the Senate, the opponents will probably fall back upon the formula of obstruction and delay which they have used so successfully for the last ten years.

Now, it cannot be denied that this measure is practical, just to all parties concerned, and dictated by wise provision for the future. The friends of conservation should see to it that their representatives in Congress give their prompt and full support to the bill, and they should urge that it be passed without emasculation, substitution, or postponement. It is of vital importance to our country while the war is in progress; it will be no less important after the war is over.

The passage of this law will secure to the American public, forever, vast natural resources, whose exploitation for the general good will be in accordance, as we have shown, with certain fundamental principles which are as old as the Republic itself.

Electricity

The Lag in Wireless Time Signals.—Some experiments were recently conducted by Mr. F. D. Orie of the United States Naval Observatory, on the lag in wireless time signals between Arlington and Great Lakes station. The lag was found to be approximately 0.085 second, with a probable error of 0.002 second.

Space Band Cleaner for Linotypers.—The latest recruit to the army of electrical appliances is an automatic machine for cleaning the space bands used with linotype machines. This device also graphites the bands. Operated by a fractional horse-power electric motor, the new machine cleans and graphites 50 space bands per minute without flattening them or in any other way damaging them.

Wiring An Army Cantonment.—Some idea of the magnitude of the new National Army cantonments has been given in these columns from time to time, but thus far no mention has been made of the electrical work involved. It is therefore of interest to note that in the case of Camp Travis in Texas about 275 miles of copper wire were required, largely for overhead outside equipment. The interior wiring called for 22,000 electric lamps, 11,000 porcelain receptacles and 11,000 rosettes.

United States Propaganda via Wireless.—In a recent statement George Creel, Chairman of the Committee of Public Information, announced that the Sayville wireless station is now being employed daily to send broadcast 1,000 words of American war news. The purpose, of course, is to reach wireless stations in German and Austria, and no doubt much of the press matter is reaching enemy countries in this manner. However, it is very doubtful indeed that the press matter ever gets beyond the operators in enemy wireless stations. Even so, it is bound to have a far-reaching effect in time.

Purifying Water by Electrolysis.—There has been recently placed on the market an appliance for sterilizing drinking water. It is also said to remove taste, odor, color and hardness, and electrolysis is employed as the sterilizing agent. The appliance consists of a large glass jar, provided with a faucet and an electrode member. The latter consists of two plates which are wired to the nearest source of lighting current. In operation the jar is filled with water and the current turned on. Depending on the amount of electrolyte salts in the water, a gallon of water can be purified in from ten to thirty minutes, and five gallons can be handled at one filling.

Electricity and the Human Body.—Lecturing on the subject of "Electricity and National Welfare" at the Leicester (England) Museum, Prof. H. T. Davidge recently brought out a number of interesting facts in this connection. He discussed electric shock, distinguishing between safe and dangerous pressures, and referring to the effect of frequency of alternation. This led to an explanation of the harmless character of high frequency currents. Subsequently the applications of electricity for medical treatment were discussed in some detail, the nature of ionic medication, brush discharges, electric baths, galvanic and faradic currents and Röntgen rays being explained. An interesting development since the war is the improvement of magnetic methods of removing foreign bodies from wounds. Electric treatment has to be given under careful supervision by men well versed in the subject, for ignorant and unskilled persons not infrequently impose electric devices on a public to whom "electricity" and "radium" may mean anything whatsoever.

Trench Wireless of the Germans.—The application of wireless telegraphy and telephony in the present war has undergone marked changes, owing to the unforeseen peculiarities of trench warfare. It was formerly assumed that wireless methods of communication would be unsuitable in such circumstances, owing to the ease with which such messages can be intercepted by the enemy. The tendency has, therefore, been to rely mainly on telephone connection, notwithstanding the ease with which this connection can be ruptured by bombardment. The destructive effect of modern artillery has made the ordinary method of laying wires along the surface of the ground or attaching them to trees of limited utility. Even buried wires are apt to be destroyed at an inconvenient moment by explosive shells, and therefore the depth at which such wires are buried has become continuously greater and the methods of protection more elaborate. The Germans have sought to get over this difficulty by laying a regular network of interconnected lines, according to L'Industrie Electrique, so that in the event of several being damaged there is still a path for the current. Even this precaution, however, may fail in a modern bombardment, and the Germans now appear to be relying to a much greater extent on wireless communication. The article to which we refer quotes particulars which are said to apply to the latest German practice, according to which it would appear that the antennae are mounted four meters above the surface, are about one hundred meters long, and emit waves of three hundred to six hundred meters. On the Eastern front about one hundred and ten wireless detachments are said to be employed.

Science

Dr. Bruce's Oceanographical Laboratory, established some years ago in Edinburgh, is said to be suffering lamentably for want of funds, and appeals in its behalf have been issued in Scotland.

Boston Office of the Coast Survey.—The U. S. Coast and Geodetic Survey has just opened a branch office in the custom house, at Boston, under charge of Mr. H. P. Ritter. The new office will endeavor to cooperate fully with steamship lines, yacht clubs, mariners and others in making available information concerning dangers to navigation, changes in channels, etc.

British Geological Photographs.—A committee of the British Association for the Advancement of Science has been engaged for many years in forming a national collection of photographs illustrating the geology of the British Isles. According to the last report the collection now includes upwards of 5,600 pictures. More than a thousand of these were taken in Yorkshire. A collection of the same character has been made by the Geological Survey of Great Britain, which has recently published a list of its Scottish pictures. Both the B. A. committee and the Geological Survey offer prints and lantern-slides for sale, and printed lists of them are available. The Tunbridge Wells Natural History Society offers prizes for photographs of scenery illustrating geological features.

Utilization of Tomato Wastes.—A recent bulletin of the U. S. Department of Agriculture demonstrates the fact that vast quantities of tomato refuse accumulating each year at tomato-pulping factories can be reduced to two products—viz., fixed oil and meal—both of which may be made commercially useful. The oil from the seeds is suitable for use as an edible oil or as a soap oil, and by proper treatment can be made useful as a drying oil for paint and varnish. The meal has valuable qualities as stock feed. The department urges the establishment of reducing plants and the adoption of a cooperative plan of manufacture in the regions where tomatoes are extensively used to make catsups and soups, the seeds and skins being at present discarded as useless. The utilization of tomato wastes seems to have made much more progress in Italy than elsewhere.

Utilization of Fish Offal.—According to the Bureau of Fisheries an unusual opportunity is now offered to fishermen for turning fish offal to account by promoting its use as a source of oil, fertilizer and fish meal. Many of the menhaden vessels have been diverted to Government use, thus diminishing the size of the fleet engaged in catching menhaden for fertilizer. Large amounts of tankage from the packing houses have been diverted for hog feed, thereby reducing the sources of supply of ammoniates. Lastly, there is a general scarcity of fertilizers, while feed for poultry and stock is commanding high prices. Hence it is opportune for fishermen to install conversion machinery for utilizing some of the immense quantity of fish offal now being wasted. The Commissioner of Fisheries, Washington, D. C., is prepared to furnish advice regarding machinery and methods.

A Census of Salmon.—Wood River, a tributary of Nushagak Bay, Alaska, has for many years been set aside as a natural breeding preserve for salmon, and is chiefly resorted to by the red salmon. In order to ascertain to what extent the salmon are able to escape fishing operations in the bay and pass up the river to their spawning grounds, the U. S. Bureau of Fisheries began in 1908 an annual count of the fish in this stream. By means of a temporary rack thrown across the river the fish are compelled to pass through a narrow gate, and are there counted by agents kept continuously on duty, day and night, for about seven weeks during which the run lasts. In the year 1916, between June 23 and August 12, the number of fish that went to the spawning ground was 551,959. They came mostly in three distinct waves, in July, at the crest of which 57,237, 47,343, and 55,864, respectively, were noted in 24 hours.

Technical Agricultural Journals.—An editorial in the *Experiment Station Record* calls attention to the gratifying increase in recent years in the number of American journals devoted to the various separate branches of agricultural science. The earliest of these, the *Journal of Economic Entomology*, was founded in 1908, and is now in its tenth volume. It is published by the Association of Economic Entomologists. The *Journal of Home Economics* was established by the American Home Economics Association in 1909; the *American Breeders' Magazine*, subsequently the *Journal of Heredity*, by the American Breeders' Association in 1910; and *Phytopathology* by the American Phytopathological Society in 1911. In 1913 the *Journal of the Society of Agronomy* was founded to take the place of the *Annual Proceedings of the American Society of Agronomy*. The *Journal of the American Association of Poultry Instructors* dates from 1914; the *Journal of the Association of Official Agricultural Chemists* from 1915; *Soil Science*, founded by Rutgers College, from 1916; and the *Journal of Dairy Science*, published by the American Society of Dairy Science from the beginning of 1917.

Aeronautics

The "Medal of Merit and Honorable Distinction" to be awarded to American and Allied aviators for achievements has been created by the Aero Club of America, which has appropriated \$10,000 for the design and fabrication of the medal in three classes, bronze, silver and gold.

Smoke Camouflage for Airplanes.—It is reported that the Gotha airplanes which raid England from time to time, are equipped with apparatus for producing smoke clouds for purposes of concealment. The smoke cloud is usually emitted when the raiders are threatened by anti-aircraft artillery; and since it has the same color and formation as the fleecy clouds overhead, the task of the gunners below is made far more difficult.

Straining the German Aircraft Industry.—Urging the French government to strain every nerve to speed up the supply of airplanes, the *Temps* states that according to a German aviator prisoner the bombardment groups which the Germans are building in their endeavors to forestall the American machines, include a gaint biplane with four motors employing bombs weighing over 660 pounds. The German airplanes made in the month of July reached a total of 2,000, and no effort has been spared to increase the number.

Is the Monoplane Coming Back Again?—From France comes the report that the monoplane is again coming into favor in the French air service. The Morane parasol monoplane, in which the planes are placed some distance above the fuselage so as to give the pilot unhampered view, has been improved and is now being reintroduced. The Morane parasol was one of the three types of airplanes with which France entered the war, but after a few months of actual service it was dropped. In its present form this monoplane is said to be a wonderful climber and to possess a great speed.

Clear Spruce for Airplanes.—The recent demand for clear spruce for the construction of airplanes and the sharp advance from \$50 to \$90 per thousand feet of this lumber have created great activity in the timber districts of Northern British Columbia, and especially on the Queen Charlotte Islands, where spruce is found in large quantities. A new sawmill is being erected by certain interests at Prince Rupert, the intention being to supply it with logs rafted across Hecate Strait. The old sawmill plant at the mouth of the Kheyex River has been acquired by Vancouver capitalists, and its capacity will be increased to 75,000 feet per day. Improvements are being made at other sawmill properties that have either been idle or working on half time, and every effort is being made to push production as rapidly as possible. The new mill at Prince Rupert and the one at Kheyex River are expected to employ about one hundred men each.

Germany's Air Strength.—Unless the Allies and ourselves exert every effort in turning out airmen and flying machines, we are not going to have that superiority over the German air forces which we look forward to some time this year. Spurred by the rumors of increased Allied production and the tremendous program of the United States, Germany has been frantically turning every factory that could possibly be spared from other work into an airplane plant. It is estimated by French authorities that the German air fleet presently numbers about 300 squadras, or a total of 2,500 machines. These are probably divided as follows: Bombarding squadras, 23; chasers, 40; protection squadras, 30; patrol squadras, 80; artillery squadras, 100; total, 273. These only represent the matériel of the armies at the various fronts, and to them must be added the airplanes and seaplanes of the navy. Again, there are a dozen or more garrison squadras in the interior of Germany and a dozen or more training camps.

How Opinions Have Changed Regarding Engines.—Speaking recently in regard to the remarkable flight of a Handley-Page biplane from London to Constantinople, Mr. Basil Johnson of Rolls-Royce, Ltd., said that when the war started the automobile firms who turned their attention to engines for aircraft very naturally looked on an engine of 100 horse-power as "a useless, cumbersome, noisy and very heavy monstrosity used either for racing 'stunts' at Brooklands or for the 'nut' to swank in Regent Street." It was natural, therefore, that to design an air engine of 100 horse-power that would be light and small was considered by most designers a problem of quite sufficient magnitude for them to solve, and it was also considered by those designers that such a high-powered engine should be ample for all reasonable purposes. It was at this time, however, that Mr. Royce struck out on a line of his own, to produce a motor of considerably greater power, as he believed the Rolls-Royce factory could produce an air motor of this high power, which would be sufficiently light to be used in an airplane. He set to work forthwith and produced the 12-cylinder Rolls-Royce engine, which gives over 350 horse-power. The record-breaking flight of the Handley-Page biplane was made possible by its two Rolls-Royce engines.



High heels in various stages of their manufacture, and their effect upon the wearer's gait, as shown by motion pictures. At the left the natural stride, at the right the constrained hobble of the three-inch heel

The High Heel in Motion Picture and X-ray

The Latest Scientific Wrinkles as Applied by French Doctors to Investigating This Sore Subject

By Jacques Boyer

THE appearance of high-heeled shoes dates only from the fifteenth century. Up to that time all footwear, from the earliest times, had had a simple flat sole. Since then, with few reactions, the trend has been toward high and ever higher heels, until the present extremes of three and even three and one-half inches have been reached. These extremes have practically given birth to a new and picturesque industry. It has been necessary to adapt modern machine tools and modern methods to this work; and that development has to a very large extent taken place in specialized establishments, quite outside the shoe factory proper.

The wood comes to these establishments in logs, bark and all. It is first cut up into boards, then into blocks, and these are piled up in the yards and left to season for two years. After this the process of drying is completed by a sojourn of a month in a bath of warm air. These precautions are for the purpose of avoiding subsequent splitting or warping of the heel; they obviously compel the makers to keep on hand at all times a very considerable stock of raw materials—a stock which is maintained always at the same level by purchases equal to consumption.

Beech and birch are the woods employed. Once completely dried, the blocks are planed and cut into pieces—trapezoidal prisms, which already outline roughly the form of a high heel, showing the proper height and length and the tapering width, although all their faces are still plane. They are then cut to give the taper from top to bottom, and gouged out behind in the desired curve, after which they appear as in the third step in our cut. The gouging machine consists of a spindle provided with blades of proper shape fixed along its axis, before which there oscillates, along a slide-bar, a small horizontal carriage holding the block of wood.

The tapered block thus prepared goes next to one of several turning machines, according to the particular style of heel into which it is to be transformed. These lathes have a vertical shaft which rotates very rapidly. Along this is ranged a battery of steel knives disposed so as to give the desired shape to the block, which is gripped in a jaw that holds it fast on a moving carriage. By proper guidance of this the work is given a combined turning and rocking movement about the cutting instrument; and under this treatment the blank soon begins to look really like a heel.

Nor is this guiding left entirely to the worker's eye. The shaft of his lathe carries a metal form for the finished heel, and the block of wood which is being worked is fixed rigidly to this. A carriage moving both laterally and longitudinally supports a roller which rests in contact with the metal form, and follows around the whole contour of the latter. The roller communicates its movements to the battery of knives and bits, which cut the wood accordingly.

There remains nothing further except to hollow out the upper surface where the heel will join the shoe, and to polish the turned surfaces so as to make them absolutely smooth and clean. Then the camouflage is in order; this consists in covering the wood with silk, satin, velvet, linen or other cloth, or perhaps with black or white celluloid or kid.

After this final step in their toilette, the heels are packed in dozens of pairs according to style and size; and the next incident in their careers is shipment to the shoe factory.

Unfortunately the fashion which calls for these heels is as unhygienic as it is unesthetic. Several years ago Dr. Dagron enumerated the troubles which these wooden stilts inflict upon their wearers. Initial pain develops into slight lameness, which increases until the shortest walk is quite impossible. As a very brief examination will show, this is due

to the bad position imposed upon the foot by the unnatural shape of the shoe. Now come Drs. Quenu and Kuss, pointing out that the artificial elevation of the heel deranges what they have very happily designated the pedal equilibrium. The muscular action, the orientation, and the mutual relationships among the elaborately articulated members of the human foot are thrown out of gear; in particular the arrangement of those joints of the foot which support the weight of the body is profoundly changed. The tibia is forced backward; there is a tendency to bend the knee; and in order to



This is what the high heel does to the bones of the feet

maintain the center of gravity within the area of support it is necessary to throw the upper part of the trunk backward, exaggerating the curve of the spine and causing the abdomen to protrude unduly.

Such are the rearrangements of the organs and members which the high heel necessitates in merely standing still; when it comes to actually walking the case is even more serious. By means of the motion picture camera Dr. Quenu has been able to analyze the constrained gait which results from a heel three inches or more in height.



Radiograph of bare foot, stepping naturally

Let us compare the films representing a young woman walking, first bare-foot, then shod.

In the first film we see the various parts of the sole of the foot in harmonious action. The heel first touches the ground, then the sole is down in its entirety; then the heel is lifted, the foot swings forward and is applied again to the ground, to leave it again in the same way. We have, in a word, a natural stride, in which the foot rocks on the ground from heel to toe, ankle and foot flexing properly to make this possible. In the second film, however, the subject passes before us in short, jerky steps, moving her foot through the air and putting it on and off the ground quite rigidly, without change of relative position of heel and toe, without any flexure whatever—giving the effect of a stiff and awkward glide rather than a step. It is the jerky progress of an automatic puppet which we have here, not the supple gait worthy of a brisk human being.

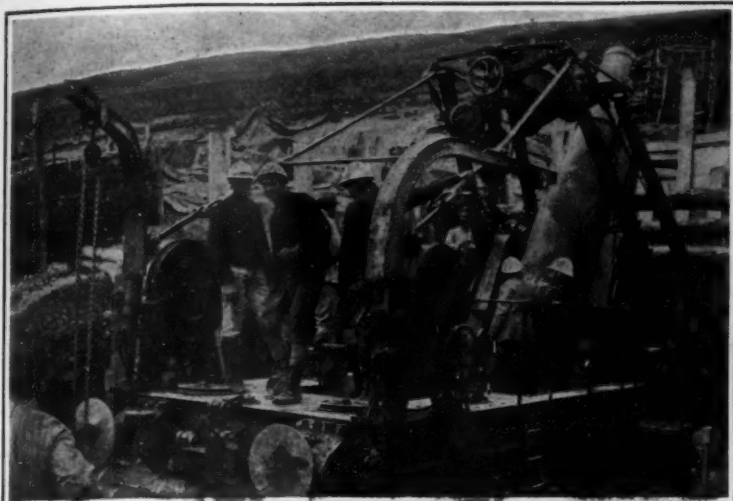
And what is even more fatal, the same parts of the foot support, at all times and wholly without aid, the weight of the body. The resultant excessive fatigue has been demonstrated radiographically by Dr. Menard. His prints show the respective positions of the bones of the foot, both when the latter is in its normal position and when it is confined by high-heeled shoes. When at rest all the bones are aimed side by side; but the shape of the high-heeled shoe throws them into an oblique position, high behind and low in front. In this position the bones of the foot proper press upon those of the toes, which, striking in turn against the bottom of their prison, in time become deformed. On the other hand, the bones of the heel take an altogether vicious position, and the whole effect is precisely that of club-foot.

Long before this stage is reached the foot has registered failure in its normal functions of balance and support, and these duties have been thrown upon the leg muscles, especially that of the calf, which must be in a constant state of tension in order that an upright posture may be attained. So pronounced is this muscular stress that it actually shows in the originals of the motion pictures which we reproduce, although as we write we are in doubt as to how much of this effect will be preserved after engraving and printing.

How Do the Germans Get Their "Smokes"?

ANNOUNCEMENT that Holland had raised its export prohibition on tobacco caused some hopes in German tobacco circles that the present scarcity would soon come to an end. These hopes have now been destroyed, however, for the free importation of tobacco is not yet in sight. All imports of this product have to take place through the Tabak-handelsgesellschaft at Bremen or by virtue of licenses issued by this concern; and the distribution of imported tobacco is effected under its supervision. Only the most necessary amounts are imported in order to avoid, as far as possible, an unfavorable influence on the German rate of exchange. Thus the imported amounts have little relation to those which were received before the war commenced. Most of the factories are permitted to have about two-thirds their pre-war consumption. From the output of these plants, which is considerably reduced, 75 per cent is taken for Army use, leaving a very small amount for distribution to the civil population. There is little present prospect of remedying the situation, which is admittedly rather serious, according to a recent article in *Beilage zur Germania*.

The high prices which must be paid for cigars and smoking tobacco may in no way be attributed to manipulations which are alleged to have been carried on by the tobacco dealers, but result from circumstances.



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This French howitzer, mounted on a railroad carriage, is firing shells over the ridge at the enemy beyond

French Wreckers of German Defenses

CORRESPONDENTS on the Western front have been telling us of late that the French army has set aside part of its artillery for wrecking purposes exclusively. When an offensive operation is decided upon, the commander of the *artillerie de démolition* is called into consultation, and to him is entrusted the task of pulverizing and blasting and burying the German works which stand in the way of the attacking *poilus*.

For these wrecking activities the wrecker-in-chief brings up whatever pieces of artillery he deems necessary. These are installed in position with relation to the enemy lines, while railroads are laid and depots are erected for the handling and storing of shells and powder. Meanwhile the air service supplies the chief wrecker with aerial photographs of the territory to be treated; and when the fire of hundreds of massed guns is turned on this territory, the aerial photographers continually report the progress of destruction. Such points which hold out longest are subjected to concentrated shelling, while others which have already been destroyed are no longer shelled. A time limit is generally set on this phase of the attack.

Typical of the cannon employed by the French wrecking forces is that shown in the accompanying illustration. It is a powerful howitzer mounted on a railroad carriage to facilitate rapid transportation. The framework over the gun for handling the shells and powder can be lowered and the gun turned horizontally when the piece is en route. A howitzer of this kind, like other French guns, has a remarkable firing rate.

Ammunition for Pneumatic Trench Mortars

AT various times in these columns there have appeared illustrations and descriptions of the pneumatic trench mortars employed by the Entente forces. In the present illustration we present the other half of the story—the ammunition employed in connection with the pneumatic trench mortars. Two types of missiles are shown, both of odd shape and provided with fins for holding them true on their course when fired at the enemy.

Belt Conveyor for Bringing Shells to Guns

THE storing of shells at the front calls for no little skill, for they must be protected from the enemy's fire and yet be readily accessible to the guns which they are to supply. In this connection the accompanying illustration is of interest, since it depicts an ammunition storage or "dump" back of the French lines. As will be noted, the ammunition is contained in a low wooden building placed in a hollow and provided with a heavily sandbagged roof. A few branches from nearby trees serve to camouflage the "dump" from the eyes of prowling enemy airmen. A belt conveyor is employed to bring the shells from the building to the top of the embankment, where they can be readily rolled to the nearby guns of the battery.

Gas Masks for the War's Horses

WHILE primarily intended to incapacitate enemy troops, the poison gas clouds and shells in use today are equally destructive to all other forms of animal life. Indeed, all horses employed in the war zone and all dogs employed as dispatch carriers must be provided with gas masks in the eventuality of a gas attack.

In the accompanying illustration appears King George of Great Britain, witnessing a demonstration of a new gas

mask for horses. This mask consists of a simple bag which is placed over the horse's nostrils so that the air breathed must be taken in through the interstices of the fabric. The bag is treated to a chemical powder which has the property of neutralizing the dangerous gases before they reach the horse's nostrils.



Copyright, International Film Service

Two types of ammunition employed in pneumatic trench mortars

The Current Supplement

IN the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2196, for February 2d, will be found a contribution to the study of the weather entitled *The Pleionic Cycle of Climatic Fluctuations*, which considers conditions prevailing in groups of years. In this issue will be found another instalment of the series on *Anomalies of the Animal World*, which is, as usual, accompanied



An ammunition "dump" placed in a hollow and its belt conveyor for the rapid handling of shells



Copyright, International Film Service

Testing a new type of gas mask for horses in the presence of King George

by a number of valuable illustrations. *Electric Vehicle Performance in Winter* contains many useful suggestions about batteries and operation. *Scenes at the Coal Mines* shows several modern devices employed in the production of coal, and discusses some of the causes contributing to the coal famine. There is an interesting article on *Indian Boats* that tells us something of their origin. *Fish Foods that We Fail to Utilize* contains some general notes on an important economic matter. The important paper on *The Collocation of Plasmas Within the Cell*, accompanied by a number of explanatory diagrams, is concluded in this issue. Other articles of interest include *Acid Bleachers for Photographic Negatives*; *The Law of Inverse Squares*; and *Exhaust Steam Waste*.

Employment of German Wounded

STATISTICS collected in the Rhine Province show that only about four per cent of the wounded men discharged from the Army are at present unemployed, although only the seriously wounded have been discharged, as those with slighter injuries are being retained for garrison and other duties. It is feared, however, that these favorable conditions of employment will not continue after the war, as the competition of sound men and especially of women will then considerably enhance the difficulty of finding work for the less fit. For this reason the advisability of making it compulsory for employers to give work to a certain proportion of wounded men is being considered, and pending the passing of such a measure the Reconstruction Commission of the Reichstag has ordered that at least two per cent of the men employed in industrial undertaking shall be war invalids. This order, however, has raised various awkward questions, such as how to compel employers to engage seriously wounded men rather than slightly injured, and whether or not an employer is to have the right to dismiss a wounded man. Again, who is to be the judge of the fitness of a wounded man for a particular job, and, if trade should be slack, are sound men to be thrown out of work while the wounded are kept on? In the works of the North-Western group of the Association of German Iron and Steel Manufacturers, 8,362 wounded men had been reinstated up to December 31st, 1916. In the first half of 1917 places were found for 2,820 more, making a total of 11,182. The 2,820 included 684 injured in the leg, 812 in the arm, 388 in the head, eyes, ears, mouth, neck and jaw; 212 in the shoulder, back, chest and spine; 117 in the hips, abdomen and groin; 128 suffering from consumption, 55 from heart disease, 183 from neuritis, and 241 who have suffered from general affections such as rheumatism, poisoning, typhoid and asthma.

A Novel Scheme for Wrecking Old Masonry

THE tremendous expansive force of quicklime has been lately used effectively in breaking up brick masonry. It was necessary to remove three foundation piers, each 12 feet by 20 feet in area and 12 feet high, and similar piers supporting working engines on each side prevented blasting. Cutting and breaking up by hand being too slow and expensive the new method was tried. Vertical holes three inches across and three feet deep were bored three feet apart in both directions and were filled to within six inches of the top with quicklime fresh and well slaked. The holes over the wet lime being closed with well tamped brick-dust, cracks started in ten minutes, soon breaking the pier-tops into three foot cubes, making subsequent hand operations easy.

Who Exports—And How?

Where Manufacturer, Commission Man and Export House Come In

By Crittenden Marriott

WE are very apt to talk of foreign trade as though it were something alike lacking in all volition and free from the operation of the laws of supply and demand. This is of course a mistake. There is, to be sure, the historic episode of the Yankee skipper who sold a shipload of warming pans in Chile. But that was in the good old days when a tramp Yankee trader was merely a legalized pirate; and besides, this particular specimen of the genus had no intention of ever returning to Chile. So in spite of his exploit, we may take it for granted that we cannot sell to a foreign merchant a commodity which he and his customers do not like or which they cannot use or of which they already have all they need.

Now this means, in the first place, that when we have anything to sell, we must ordinarily expect to display at least ten per cent as much intelligence in selecting a market for it as a German Gesellschaft would bring to bear upon a similar problem. Selling ability and knowledge of conditions go hand in hand in building up a successful export business. But there is another significance that points in quite an opposite direction, and this is that with sufficient knowledge of conditions we may frequently dispense with selling ability altogether. In other words, certain classes of commodities, among which a prominent position is held by natural products like wheat, cotton and lumber, normally sell themselves, for the world has absolute need of them.

But such a state of affairs frequently leads to an unfortunate issue. There is obviously some effort involved in all trade; and when the exporting producer fails to shoulder this, it automatically falls to the lot of the importing middleman, who promptly proceeds to appropriate for himself all the profits. The lumber trade furnishes an excellent case in point.

In normal times it cost about \$13 a thousand to produce lumber on the Pacific Coast, and the lumbermen were contented to get a profit of a dollar a thousand. In the last two or three years they have got far less and have been facing ruin. Yet for a far longer time the middlemen in Australia, who imported the lumber, were making fortunes. The total cost, delivered at final destination, everything paid, was seldom or never more than \$30 a thousand. Yet the lumber was retailed at \$56 a thousand, a profit of more than 80 per cent.

When prices in Australia change they change at the rate of \$6 a thousand, neither more nor less, and the Pacific coast producers could probably have added at least \$4 a thousand to their export rate without causing any retail advance at all in Australia. But the Coast generally did not know this and, in deference to the Sherman law forbidding coöperation, the producers continued to carry on cut-throat price competition for the foreign trade that impoverished them.

Recently they have made efforts to remedy this state of affairs by forming two coöperative associations that may or may not be in violation of the Sherman law. Lawyers say that they are not; and at any rate the lumbermen seem to think that they might as well go to jail for violating the law as to the poorhouse for observing it. The two associations control, respectively, 80 and 90 per cent of all the redwood and fir that is to be exported. Neither organization does any domestic business. They sell the lumber abroad on a commission basis and distribute as dividends the profits that they have reclaimed from the middlemen.

This expedient is plainly a modification of the export-house idea. In dealing through established export houses it must be remembered that their functions have radically changed of late years, almost all of them having evolved from commission merchants into export merchants, selling chiefly on their own account and always working to enlarge their own sales. What commission business they still handle they do either as an accommodation to old customers or as a stop gap for some demand which they are not ready to supply on their own account. They cannot afford to drop a client's goods in order to job similar goods on their own account. But if a client wishes to leave them they rarely take much trouble to prevent him. They have the machinery and the trade and have learned the technique of his line; and therefore they can usually handle similar goods on their own account at a profit greater than their commission.

It is fair to add that they have been forced to become merchants by the delinquencies of American manufacturers, a very large proportion of whom in the past have been of the stormy-petrel type, but little better than the warming-pan hero—men who exported goods when the domestic market was bad and who, all too often, postponed or altogether failed to fill orders, even orders that they had accepted, when a turn in the market made it more profitable to sell their goods at home. The export house which had taken the order had then to fill it or "queer" itself with its customers and lose its reputa-

tion for reliability—a loss that would injure its business in all the manifold lines it carried. So it filled the order, often at a heavy loss. A few such experiences were enough; the export house became a merchant instead of a commission man, and retained the profits made when foreign business was good and domestic business bad, to offset the losses when the reverse was true. It follows that export houses are not ordinarily seeking to obtain new domestic accounts.

Nevertheless there are times and ways in which they may be of great service to would-be exporters. Soon after the war broke out two cough-drop manufacturers found themselves in difficulties. The winter market, for which they had stocked up, did not materialize. People stopped having colds or at least they stopped buying cough-drops to cure them, and the firm found itself left with a huge unsalable stock on hand. In this emergency it occurred to the junior partner that they might sell some drops abroad through an export house. The senior partner derided him. The junior thought that very probably his senior was right. Nevertheless he wrote to half a dozen of the bigger export houses, and got a letter from one of them asking him to call. He did so and made a contract which, if it did not net the partners a very large profit did at least save them from what would have been a severe loss.

After the agreement had been signed the cough-drop maker asked the manager of the export house about it. "We thought our line would be too little for you to handle," he said. "We had an idea that you took only large accounts!" The manager was very frank. "Lots of manufacturers think so," he agreed. "But they're wrong. It isn't so much how big the account is as whether it meets our needs. We supply a lot of foreign firms with pretty much everything they import and we want to keep their business to ourselves. We don't want them to get into the habit of buying from another export house, which might eventually displace us in other lines. Each of these foreign stores of course sells hundreds of articles that it does not import, and when a home firm, like yourself, offers us something that competes with one of these articles we are apt to try it, no matter how little profit there is in it, just to keep our competitors from getting in with it and perhaps eventually using it as a wedge to split our business."

Another way of selling abroad without doing business abroad consists in selling goods at home by application to representatives of foreign firms who have come to the United States on wholly different errands. Details must vary infinitely; but a particular example will explain the general principle.

The sales manager of a firm that produces machine tools for making locomotives thought he saw a field abroad, but could not convince his employers to spend any extra money as an entrance fee. So he determined to show them by earning a profit without expense. The problem, was really a hard one, as he could not go or send men abroad to urge the tools on foreign builders; and he had very little faith in catalogue sending. In short, he had no means that he considered effective to reach across the ocean for the business. So he had to evolve a plan that would bring the business to him.

He began to keep tab on purchases, by domestic railroads, of goods other than his own. He did not make trucks, for instance; but he watched truck purchases by American railroads, well knowing that representatives of foreign houses would be sure to try to land any substantial contract that offered. He found out when these men would be on the ground and he made a point of seeing them and of inducing them to go with him to a railway shop where his machines were in use and could be seen in actual operation. Then, of course, he would furnish them with catalogues and carefully prepared figures. Later, if need be, he would send follow-up letters. He also met prospective customers at international conventions held in the United States. In less than a year he was able to go to the heads of his firm and show them an aggregate of foreign orders that made them open their eyes. Today the foreign trade adds substantially to the profits of the business.

We have remarked that if a people do not want our goods we cannot sell to them. But sometimes we can make them want what we have to offer. Thus, a Pacific Coast dealer in rice had a hard time in starting an export end to his business in South America, even after he had one going at high speed in the Orient. The basic difference, of course, was that rice is a staple product in the far East and an exotic in South America. It sold in the one place despite competition because everybody wanted it, and even in the absence of competition it did not sell in the other because practically nobody wanted it. The taste for it had to be cultivated.

The firm began by sending broadcast catalogues with

cuts of samples and descriptions in Spanish. Perhaps it sent them unwisely, for it got almost no replies. Then it applied to United States consuls for help. The consuls did their best but results were nil. Then it tried banks with equal non-success. Finally it got down to rock basis and took one country at a time and established a show room, conducted by men who knew the people. This time it won and built up a very profitable business.

Another scheme of adaptation has been worked out fully by a house that exports large numbers of graphite crucibles for furnaces, assaying, and kindred work. This firm began exporting in a small way to one foreign state and found it hard sledding for two years. When at last it had begun to get satisfactory returns it turned to another country, expecting to succeed there easily by the aid of its experience in the first country.

But it was disappointed. It did indeed profit, but by no means so greatly nor so rapidly as it had expected; and finally it had to adopt an entirely different method. Today it sells to London through jobbers, making its own prices; to Cuba by agents, with whom it deals on a 10 per cent basis; to South America through export houses; and to other countries through the salesmen and agents of cognate manufacturers on a sliding commission scale. Every one of these methods has been adopted after experimentation in other lines. The firm could never have succeeded as it has if it had been unwilling to learn and to change, if it had insisted upon clinging to old methods because they had succeeded elsewhere.

American manufacturers have often been abused for their failure to study the demands of foreign markets in regard to packing and for failing to adopt the methods desired by their foreign customers. This abuse has really been a good deal overdone and there is good reason to believe that a lot of it is merely parrot-like repetition of stories started by foreign business rivals who want to keep the trade for their own nation and shut out the United States. Although it is, of course, advisable to pack goods as is customary in the country to which they are to be sent it is not really necessary to do so in any very great detail. The essential thing in shipping goods is to know whether they are to go to a port where the ship can lie alongside a pier and discharge cargo readily or whether they are to go to a place where cargo must be lightered ashore. It is very obvious that goods that are to be loaded into lighters, perhaps in rough water, must be packed differently from those that can be swung ashore by a big stationary crane. A second requisite, about as important, in South America at least, is that the goods be marked with their approximate dimensions and weights in the metric system.

An American manufacturer who has a terrible time converting liters into gallons, kilograms into pounds, and centimeters into inches should understand how grateful the Latin American will be if he finds the reverse calculation made for him. If these requisites are met, common sense methods will serve for most of the others, though of course, close observance of details will do no harm. The fact is, that in dealing with South America it is not so necessary to follow South American customs as might be supposed, for only about ten per cent of the trade goes to real South Americans. Most native Latin Americans are politicians or land-owners; nearly all the important business is done by Europeans—especially by Germans and English—or is carried on by native houses that employ Europeans.

That our packing methods are not really unsatisfactory to foreigners when made with reasonable discrimination is evident from our shipments of locomotives, for instance. Since the war began a single American company has shipped more than 400 locomotives to Siberia. They were taken apart, packed for shipment by our own home methods, and sent via Magellan or the Panama Canal to Vladivostok where they were put together and sent, on to destination under their own steam. Less than one-tenth of one per cent of the order was broken or lost in transit.

Similar results were obtained in South America, specifically in Colombia. Bogota, the chief city, is a good customer for railway material despite the fact that it is cut off from rail communication with the coast. Its railroads are all short lines running among Andean valleys and peaks. The pioneer American firm to invade the country built its locomotives complete in the United States, then took them down, numbered the pieces, and packed them in boxes. When they arrived at the coast city of Medellin the pistons, cylinders, rods and other large parts were wrapped in burlap and placed on mule back for conveyance to Bogota, where they were fitted together again. The venture was so successful that a very profitable and, under the circumstances, a surprisingly large trade was developed.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Altering the Enfield to take the U. S. Army Cartridge

To the Editor of the SCIENTIFIC AMERICAN:

I do not feel inclined to take issue with the SCIENTIFIC AMERICAN over its summing up of the findings of the Congressional Committee as to the sins of omission of our Army Ordnance Department—Page 470, your issue of December 22d. On the face of it the case looks black for somebody, but before definitely saddling the blame on the Ordnance head, it is well to keep in mind the fact that the ethics of the profession prevent army officers rushing into print to defend themselves, just as it prevents them from "passing the buck" to their superiors before a Congressional investigating committee. Likewise there is much asinine legislation tying the hands of the army and navy people, passed by the same set of fellows who are now having their grand fault-finding bee.

The case of the Lewis gun is raw—apparently there are few redeeming features to the matter when one has followed it from the beginning.

The writer must, however, take issue with the statement that an error was made in altering the British M 1914 Enfield to shoot our own army cartridge. A far greater error would have been to adopt the gun as it was then available—for the British service cartridge. The delay is most unfortunate, and on the surface of things, much fault can be found with somebody—possibly Congress—possibly the Ordnance Department—that the changes in the tools to make the modified Enfield were not made before war was declared. There was no doubt in the minds of anybody after the fateful declaration of the blockage of the Allied waters, that this country would shortly be at war with Germany.

Despite the delay—which is less serious than it is painted in view of the time taken to train troops—the change in the rifle to fire our own superior cartridge was sane and well-advised. Save for the one thing—elimination of some of the delay in rifle production—there is not the slightest reason for considering the adoption of the rifle in its original form for the .303 British cartridge.

By the same logic, if the British had been compelled to take up a rifle to fire their old .45 Martini cartridge of black powder and lead persuasion, I presume we should have adopted that inferior cartridge instead of altering the arm for our own.

The British Mark VII cartridge of .303 caliber, for which the original Enfield M 1914 was made in our factories, is an archaic and unsatisfactory contraption from the ballistic standpoint. It is a rim shell of almost precisely the form of the old .30-40 or M 1898 cartridge we used in our Krag-Jorgenson and which we abandoned in 1903. The British, hesitating in the hope of obtaining a satisfactory self-loading rifle, and held up by the parsimony of the powers that be, changed the old bullet in this cartridge to one of modern spitzer form and 175 grains, and ran up the velocity to 2,440 foot-seconds in the effort to keep up with the procession.

While the British bullet flies little higher than our own bullet to hit the mark at a given range, the rim form of the cartridge and the limited powder space make it entirely out of date. In fact the British had sealed a new cartridge, the .276, and had designed this new Enfield rifle for the new cartridge—when war came and stopped the change.

The rim cartridge lends itself poorly to charger-loading, and it does its best to cause jams in the magazine. Because of the protruding rim it takes up more room in any sort of cartridge receptacle—magazine or clip or belt. The rim form of shell is archaic and abandoned and is tolerated only by those nations not able to re-arm or waiting for the coming of the satisfactory self-loading rifle.

Our own very superior 1906 cartridge, the most accurate in the world, and of the rimless type, is now 12 years old and is no spring chicken itself. To throw back to a cartridge designed in form in 1890 and admitted to be unsatisfactory by the British is quite apparently foolish if there were no other considerations.

However, there are other considerations. One of them is the huge waste of money involved in manufacturing say two millions—\$50,000,000 worth—of rifles for a cartridge that is admittedly out of date and inferior even before the manufacture starts.

Another is the obviously dangerous procedure—avoided always by ordnance departments—of having two different cartridges in the same army, and therefore two different rifles and two different machine guns, because it is obvious that the machine gun ought to fire the cartridge of the army to which it is attached.

It is true that there are now on the West front four distinct types of small arms cartridge—the French Lebel with copper bullet and rim shell, the British .303, the Belgian .30, and the United States 1906. They are,

however, in the hands of entirely different armies, handled by different supply organizations, in the hands of men uniformed differently and usually kept entirely separate along the west front. Obviously this is not practical with different units of the same army, armed with rifles and machine guns firing two different cartridges. Considerations of hasty transfer of troops and reinforcement of threatened zones would always have to include the fact of the rifle with which the units happened to be armed. The result would sooner or later be what is known as a lovely mess. Just one mental picture of the hard-pressed platoon hurriedly reinforced by another platoon bearing bandoliers of ammunition for the .303 rifle when the first platoon was armed with the Springfield, is enough to settle the question. If you fancy that units can be kept nicely separated in the turmoil of an enemy making sudden and vicious and dangerous attack, then read the history of the war thus far.

The danger of the submarine cutting off the ammunition supply to the soldiers in France is a very negligible one. It is like a man depending on first aid parties of his friends for his food, worrying lest they fail to keep him supplied with dessert. When the submarine stops the shipment of such compact supplies as small arms ammunition, then it is time for our troops to climb a tree, because it will also have stopped the shipment of food, ammunition for the big guns and other supplies, taking up more room and more vitally dependent on regular transportation. Armies do not live from hand to mouth, reserve stores are always available, and small arms ammunition is being turned out in ample quantities at the present time to ensure a huge reserve store in France in time for the American activities. When our troops run out of our splendid 1906 cartridges, then they will also have run out of big gun ammunition, grub, medical supplies and other things that even the British cannot supply for a million or two more men—and the war so far as we're concerned, will be over for the time being.

A million 1906 cartridges, packed in the somewhat wasteful-of-space cases of our army, weigh packed about thirty-seven tons, and can be stored in a space 20 x 15 x 50 feet. Let the person familiar with the available cubic feet in the hold of some of our huge ships, turn his pencil loose on the problem of how many million cartridges a single ship can carry. Then let him figure the room required to transport such bulky and "uneconomical" objects as shells for the 9.5 inch gun and he'll cease to worry as to the possible cessation of the small arms ammunition supply, however, it may bring gray hairs over the big gun supply.

It is fashionable to "take after" the army departments with a club. It is only fair at the same time to credit the Ordnance Department with much sense in refusing the inferior and unsatisfactory British cartridge for the new rifle, and altering the arm for our own ammunition.

Where the War Department does need the big stick is for its stubborn and asinine refusal to utilize one—just one even—of the thousands of at present unattached civilian experts in the use of the military rifle. There were some 90,000 of these men available when war broke out. For years they had owned or had used by loan from the Government, our military rifle, and would make far better instructors than the well-meaning, but utterly unskilled gentlemen from the training camps who fired during their "cram" course something like 100 shots, some of them less. Rifle shooting like the working knowledge of the gas engine is not something that may be gained by "cramming." Time is the essence of the contract.

Los Angeles, Cal.

EDWARD C. CROSSMAN.

Finding the Submarine

To the Editor of the SCIENTIFIC AMERICAN:

The prospect held out by Mr. Julius S. Price, in the last, December 15th issue of your journal, may become a serious fact ere our Allies or our Government assume to act with the vigor the conditions call for in the anti-U-boat campaign.

Your valuable editorial of October 6th on the subject of, "The Submarine as an anti-U-boat weapon," was forcible, and, may we not hope, a practical solution of the question?

What I recommend is feasible and practical, and will grow from the smallest unit to the covering of the seas with Entente U-boats which will ultimately make the presence of a German U-boat so infinitely as to be a negligible factor in the progress of this war. It means the replacement of the German U-boats by those of the Entente allies, and the work can be put under way at once with the factors now at hand.

Wherever a German U-boat may be, it is possible for an Entente Scout U-boat to operate in the following manner to detect the presence of the former.

The probable location of the German U-boat having been given through reports of freighters, steamers, destroyers or any other agency, one or more Scout Entente U-boats is assigned to that locality, to which they proceed quietly, secretly and remain submerged as much as possible, depending on the periscopes;

taking advantage of the morning and evening twilights, and lighter nights to observe the unsuspecting German U-boat rise to the surface. (The Entente craft lying quiescent will prevent the German sound detectors from being aware of her presence.)

The location of the enemies U-boats here and there, throughout the great field of their operation, will enable an extensive chart to be provided that will show at a glance their general location and enable the commander of the Entente flotilla to take advantage of such information.

GEORGE EDWARD FELL.

Chicago, Ill.

The Metal Spray for Sheathing Ships

To the Editor of the SCIENTIFIC AMERICAN:

I submit the following suggestion with the idea that it might prove of value or be worth experimental consideration.

Claim.—I have not seen a Schoop metal spray, nor the product therefrom, but in their literature they state that wood can be coated with metal. If such is the case—unless it has been proven otherwise—it should accomplish the following when applied to the hulls of wooden ships:

- (1) Protection of the wood from all attack by worms and other water pests, which tend to destroy it.
- (2) Increasing the speed due to the smooth surface offered to the water.
- (3) Reduction of the boat's time in dry dock, owing to the enhanced protection afforded by this layer.
- (4) Supplying the same result as a metal sheathing, but requiring less than one-hundredth of the metal used in sheathing.
- (5) It could be applied as a protection against rot.
- (6) If satisfactory its field is not limited to ship hulls, but to all similarly exposed surfaces to sea water.

Further, although zinc is electrochemically attacked to a certain degree by sea water, it offers a possibility of being the only metal of which there is an over production at the present time, and, therefore, a source of supply is practically at hand.

D. M. KERN.

Broken Hill, Australia.

Conserve Coal

To the Editor of the SCIENTIFIC AMERICAN:

A great deal of coal—especially soft coal—is burned in direct-draft heating stoves, with as short a distance to the flue as is possible. In most of such stoves—owing to the small amount of the heating surface—the consumer does not get over from twenty to forty per cent of the heating value of the coal. All such stoves should have a hollow drum or an open end oven on them above a short joint of pipe and the damper that is generally used in the pipe should be above this drum and as near the chimney as possible so as to give more heating surface. Such a drum will double the heating surface and amount of heat given out and by causing a circulation of air equalize the heat in all parts of the room. It will save its cost every 60 days during cold weather by saving of coal, aside from greater comfort.

FRANK HOSKINS.

Salem, Ill.

Eyes for the Navy

THE Navy is still in urgent need of binoculars, spy-glasses and telescopes. The use of the submarine has so changed naval warfare that more "eyes" are needed on every ship, in order that a constant and efficient lookout may be maintained.

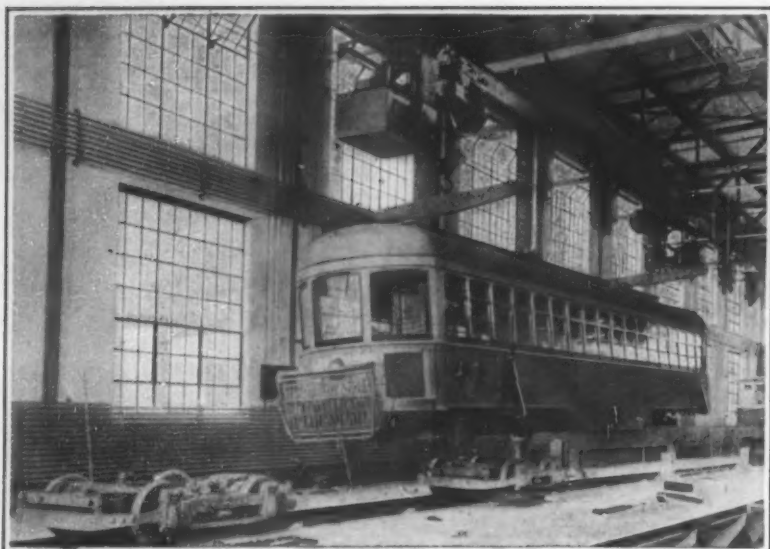
Heretofore, the United States has been obliged to rely almost entirely upon foreign countries for its supply of such articles. These channels of supply are now closed, and as no stock is on hand in this country to meet the present emergency, it has become necessary to appeal to the patriotism of private owners, to furnish "eyes for the Navy."

Several weeks ago, an appeal was made through the daily press, resulting in the receipt of over 3,000 glasses of various kinds, the great majority of which has proven satisfactory for naval use. This number, however, is wholly insufficient, and the Navy needs many thousands more.

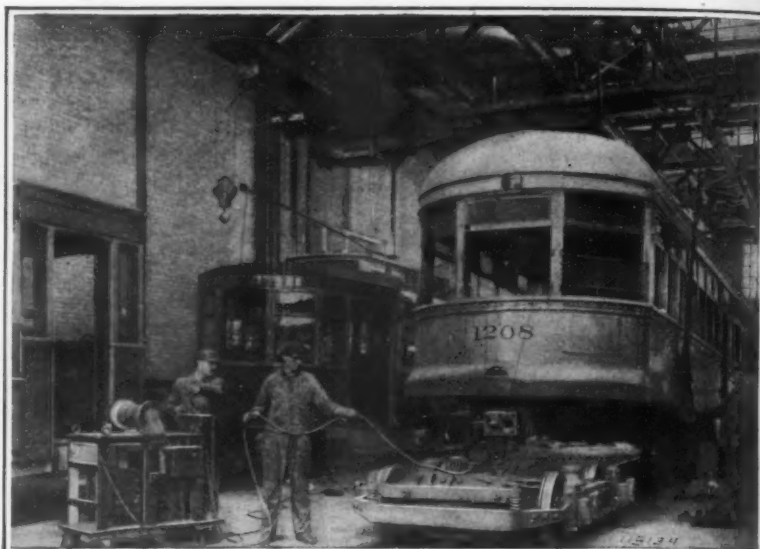
All articles should be securely tagged, giving the name and address of the donor, and forwarded by mail or express to the Honorable Franklin D. Roosevelt, Assistant Secretary of the Navy, care of Naval Observatory, Washington, D. C., so that they may be acknowledged by him.

Articles not suitable for naval use will be returned to the sender. Those accepted will be keyed, so that the name and address of the donor, will be permanently recorded at the Navy Department, and every effort will be made to return them, with added historic interest, at the termination of the war. It is, of course, impossible to guarantee them against damage or loss.

As the Government cannot, under the law, accept services or material without making some payment therefore, one dollar will be paid for each article accepted, which sum will constitute the rental price, or, in the event of loss, the purchase price, of such article.



The overhead monorail crane that lifts the body from the trucks and, when necessary, takes it to another part of the shop



Running the truck out from under the car body on its own power, with perfect safety for all workmen

The Twentieth Century Trolley Hospital

Some of the Interesting Features of Cleveland's Big Electric Railroad Repair Shop

IN every transportation enterprise the business of maintaining the equipment in good order is of fundamental importance. In no case is this more essential than with the electric street railroads of our large cities. Under normal circumstances the steam road has a considerable surplus of cars over the immediate demands, both in its passenger and its freight branches; so its car shops do not have to be keyed to the highest pitch. But the margin of safety between the total volume of rolling stock and the demands made by the morning and evening traffic peaks is, with a well conducted street railway, very slender; for if it were not so, there would be an unduly heavy capital investment standing idle 20 hours a day. The street railroad is always embarrassed in this respect anyhow, and can only keep that embarrassment within bounds by a very careful adjustment of car supply to maximum traffic.

This adjustment in turn requires the greatest possible speed and efficiency in the repair shops. For it is obvious that the moment we find it necessary to send cars to the repair shop with undue frequency, or to keep them there unduly long, the slender margin of safety will be wiped out and we shall have in its place an actual car shortage. Moreover, in the thickly congested line of trolleys that fills the main traffic artery of one of our large cities morning and evening, a delay of five minutes due to a car in poor shape—a delay which would hardly be a source of even petty annoyance on a railroad or an interurban line—may derange the operation of the entire system for hours, and in any event is certain to be a serious source of confusion and loss of revenue to the company, and of inconvenience to its patrons.

Accordingly it is distinctly up to the repair shops to reduce to a minimum the time spent in enforced lay-ups by every car—and that means that both the number and the duration of every car's trips to the shop must be curtailed. This is made possible only by prompt action in sending cars to the doctor for small ailments, and by rapid and thorough work on the part of the men who do the overhauling. But a prerequisite to rapid and thorough work is first class equipment; and it is with a

view of displaying some of the apparatus used and the things done with it in the up-to-date trolley hospital that we present the pictures on this page.

Anyone who has ever ridden on a trolley which developed symptoms of internal derangement en route must have observed that the seat of the difficulty,



The elevator track-section that makes wheel replacement possible without raising the car body

judging from the actions of the crew, lay beneath the car. As an example of the great principle of get out and get under, a semi-crippled trolley car is in the class with the automobile of 1905. So the first thing which we see when we enter a trolley repair shop is a vast expanse of track after track, each with a deep, electric-lighted pit filling the space between the rails—a pit in which a

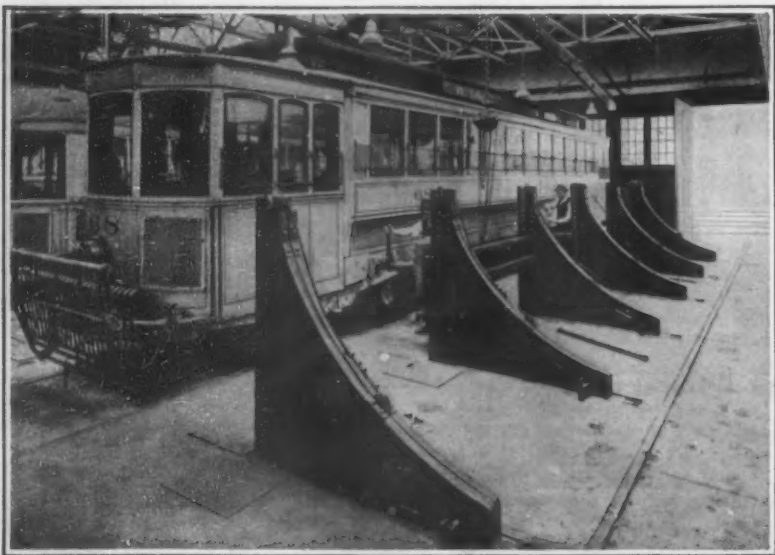
man can stand upright and work on the concealed vitals of the cars above him. This arrangement is in fact an old one; but several accessories of the working pit which have been developed at Cleveland are sufficiently novel and interesting to win a more or less full description.

For instance, it is often necessary to remove the front or rear truck from a car for repair or replacement of the motor or some other part. It is easy enough to take out the king pin and jack the car body up; but after this it has been customary for a couple of workmen to push the truck out by hand power, working with difficulty from a very awkward position. The remedy for this is so obvious that one wonders why it has not long ago become universal practice. It consists merely in hitching the freed truck to a portable source of current and running it out from under the car with the power of its own motor, as shown in our cut. If the trouble is with the motor, this can then be disconnected and lifted out by a crane and the whole operation has consumed but a fraction of the time formerly required. Moreover, as soon as the truck is clear of the body, the latter may be lowered upon blocks placed on the floor, so that the crane or the jack, as the case may be, is released for other service.

This brings up another point. We have said "crane or jack." To the question which it shall be the up-to-date car-shop superintendent has but one answer. The jack is all very well in its place; but that place is out on the line, raising a car to release a pinioned victim of accident, or to permit first aid treatment that will make it possible to get a crippled car to the barns. In the shop the crane is far and away the master. It is more quickly applied and operated, more easily controlled, less liable to sudden and disastrous failure, and—crowning advantage of all—it can walk away to another part of the shop and take the suspended car body with it.

Another great labor-saver is the "wheel pit-jack." Once upon a time, in order to replace a wheel it was necessary to raise the car body and dismantle the truck. Now we have a section of the repair track supported on an elevator which, operated by compressed air under

(Concluded on page 117)



The huge steel jaws against which misshapen trolley cars are pressed by powerful jacks to straighten them



The mechanical seat-scrubber that substitutes revolving brushes operated by power for elbow-grease

Shotguns for Our Aviators

By Edward C. Crossman

AT last the airplane is recognized as being a winged object, and the gun of the wing-shooter is to be used to bring it down. Another prognostication made frequently in the popular press is about to be fulfilled. It is the intention of the Aviation Section of the Signal Corps to give the candidates for flying instruction as much practice as possible with shotgun, rifle and machine gun.

At short range—which means at 100 yards or less—the shotgun with buckshot or the largest sized pellets just under this designation, is a more potent weapon than the machine gun. Lacking range and penetration and accuracy because of the spread of its pellets at any serious range, the shotgun, preferably the automatic shotgun, covers more territory at 50 yards or 75 yards than any machine gun, and each discharge throws a cloud of round bullets instead of the high concentrated, narrow stream of the machine gun. Contrary to common impression, the machine gun is not an all-pervading sort of a weapon. I stood behind one firing at two man-figure targets at 150 yards. The gun fired two clips of 60 shots for the total without touching either figure, and the figures were handily situated on a hillside which marked by the dustpuff, each shot. Were they in air without a background to show bullet impact, the gun might never have hit them. As we at the side could see, the bullets were striking just over the figures, and the narrow cone at this range was not sufficient to touch them with the slight mislaying of the gun. But, to the crew, the gun was fairly tearing them to bits.

At shorter range the tendency to miss clean with the machine gun is still more marked. Here one bullet fairly follows on the heels of the other, the huge dispersion of the machine gun at longer range, caused by the vibration of the gun, and variation in ammunition, is absent. In effect the weapon is merely the infantry rifle; if the first shot of the burst misses, the next score will also likely miss, until the alignment of the gun be changed by its recoil or by the movement of the plane.

Also the machine gun is not a speedy weapon to handle; some planes have the guns mounted practically integral with the plane and it is necessary to point the plane to point the gun. When the other aviator swoops and comes up close aboard, with the gun pointed off in some other direction, then is the time when a few rapid shots with the automatic shotgun are likely to clean out the opposing plane.

Buckshot is not unlike shrapnel, the chief difference being in the smaller size of the buckshot. The velocity of both is low, buckshot having the best of the argument when used over buckshot ranges, as compared to shrapnel at usual shrapnel distances. Both are round leaden missiles with considerably blow but not much penetration, hence the light steel shrapnel helmets of the French and British troops.

It is this buckshot that will be the logical load for the shotguns of the American aviators. It is not a new man-killing arrangement. For years the sawed-off shotgun has been the favorite weapon of the American really out gunning for the other fellow or expecting the other fellow to come a-gunning for him. The sawed-off part of the contract is merely to get rid of the choked portion of the barrels at the muzzle and so let it handle buckshot better, and to make the gun shorter and easier to swing. At revolver ranges no more fearful weapon was ever put into the hands of man. It is far more accurate than the revolver, while its dozen or so round bullets made hitting nearly sure with any sort of pointing.

Sentries of our army have been for years armed with riot guns for certain guard duty—a riot gun being merely a repeating or automatic shotgun shooting buckshot. Express messengers and guards of other sorts of treasure pin their faith to the short shotgun on the brackets close to hand.

For months gentlemen interested in gunnery have argued the desirability of the use of the automatic shotgun for breaking up charges because of the greater number of missiles thrown, and the rapidity of fire, and reports are that these guns are used experimentally at least, in some of the trenches. From the Allied standpoint, however, the gun is not much use because the Allies are on the offensive and this calls for the rifle with the bayonet.

When it comes to a choice among shotguns, there can be but one decision. The automatic or self-loading shotgun is of



A typical shot-gun performance at thirty yards

much greater speed than the pump variety in the hands of the average man, is more positive in function and there is practically no disturbance in the aim between shots, because neither hand has to be moved, and the recoil is translated into more of a push than a blow. There is no difficulty in firing five shots through the automatic shotgun in about two seconds.

Buckshot ranges in size from nine to twenty-seven to the ounce. The writer recently put a few loads of No. 1 Buck through their paces to see what might be expected of this quite average load.

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The Spad Pursuit Biplane

By John Jay Ide

THE most successful fighting airplane in the world today is without question the Spad. It was, of course, the mount of the late Captain Guynemer, who, it will be remembered, accounted for 53 machines before being shot down last September, just behind the German front line. The most proficient pilots in the Lafayette Escadrille also use this machine. That it is difficult to handle is proved by the fact that the former French commander of the squadron, Lieut. de Laage de Meux, (now succeeded by Captain Thenault) was killed by a tail slide to earth while attempting to rise "en chandelle."

The history of the Spad is curious. It owes its origin to Armand Deperdussin, a former silk merchant of Lyons who amassed a large fortune by a series of swindling operations. In 1910, he proceeded to sink most of his gains into aviation, establishing a huge flying field and factory near Rheims and engaging a brilliant young engineer named Béchereau. The result was that the Deperdussin monoplanes acquired an international fame, winning the Gordon Bennett Cup at Chicago in 1912, and at Rheims in 1913—the latter event at the rate of 124.5 miles an hour. This speed was made possible largely by the monocoque construction of the fuselage, greatly superior to the rectangular body section then in vogue on other machines.

After the arrest of Deperdussin some time before the war, the directors of the firm retained Béchereau as designer and changed the name to Spad (Société pour Aeroplanes Deperdussin). This was again changed quite recently to "Société pour l'Aviation et ses Dérivés," keeping the same initials as before. Deperdussin's trial finally took place a few months back, and a merely nominal sentence was imposed on account of the great services to the cause of French aviation rendered by the defendant.

There is no questioning the genius of Béchereau. Before Herr Fokker had invented the gearing permitting the machine gun to shoot through the propeller disk, Béchereau patented and used a separate cockpit for the gunner mounted in front of the tractor screw. This cockpit was attached to the landing carriage by struts

and to the fuselage through the center of the propeller. Of course, the efficiency of the latter was rather low under the circumstances, and this scheme was soon abandoned in favor of the cam and lever timing device on the engine shaft. On the Spad XIII there are two Vickers machine guns placed on top of the motor, one on each side of the center line. They are not quite parallel to each other, the bullet paths intersecting about one hundred yards in front of the machine.

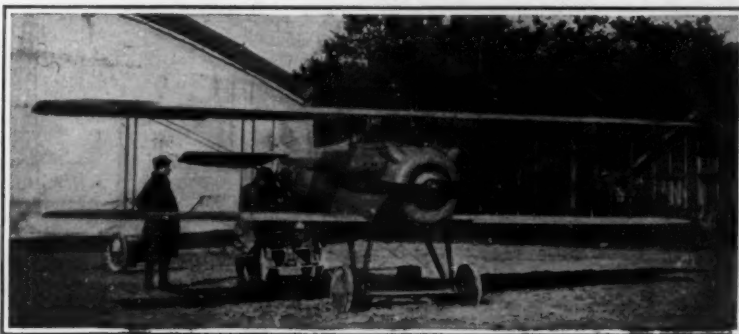
The planes of the Spad are of exactly the same size and shape, being rectangular in form with the corners rounded off. The two main spars are closely spaced, leaving a comparatively great overhang aft of the rear spar. This allows a large semi-circular portion to be cut out over the pilot's seat to aid vision. The ailerons, employed on both wings, being quite narrow, are carried on subsidiary spars about nine inches back of the rear main beams.

The interplane bracing is one of the distinguishing features of the machine. The wires from each side of the fuselage section and from the outer struts cross at the centers of the intermediate struts. The fore and aft intermediate struts, which are of smaller section than the others, are connected by a steel tube brace, while the outer pairs of struts have the usual diagonal bracing between them. The stays running from the bottom of the fuselage section to the top of the outer struts are doubled and streamlined, whereas the reverse wires are single.

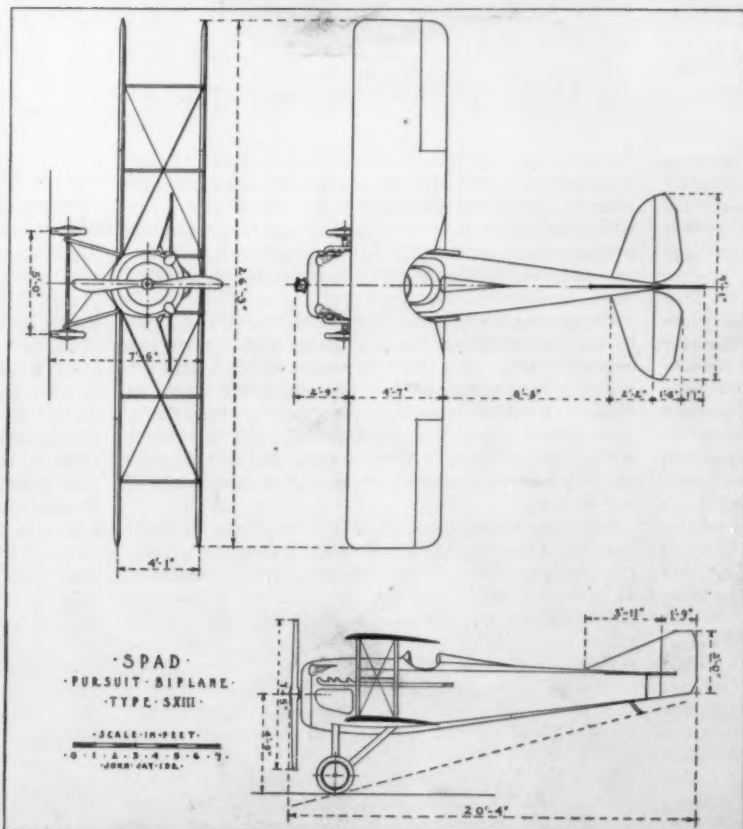
The fuselage is exceptionally deep and its top and bottom heavily streamlined. It was found impractical to curve the sides on account of the poor downward vision resulting therefrom. Head resistance due to the exposed portion of the pilot is discounted by a conical projection behind the cockpit fading into the body top.

The forward part of the fuselage housing the power plant is covered with aluminum and has large inspection doors on each side. Perforated projections indicate the cam shaft covers. In front of the motor is placed the circular radiator, the great area of which must interfere somewhat with the efficiency of the propeller. That no spinner was fitted over the latter indicates,

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Front view of a Spad biplane employed by the Allied forces during 1917



The three sections of the Spad machine

The Heavens in February, 1918

Our Nearest Stellar Neighbor
By Prof. Henry Norris Russell, Ph.D.

THE most remarkable astronomical news of the past month comes from South Africa, and deals with a faint star which appears from the information so far available, to be the nearest of all in the heavens.

In the year 1916, Mr. Innes, of the Observatory at Johannesburg, which is maintained by the Government of the Union of South Africa, discovered a faint star in the constellation Centaurus, which had a very rapid "proper motion" among its neighbors.

The star is very faint, especially on photographs (as it is very red), and it would have been impossible to pick it out from among the hundreds and thousands of others had it not been for the powerful aid given by the "blink microscope." This is an apparatus into which two photographs of the same region of the heavens may be inserted, and viewed alternately through the same eyepiece—the shift of a little lever moving a mirror which throws first one and then the other into the field of view. When the two plates have been properly adjusted, the images of the great majority of the stars on one may be brought into exact coincidence with those on the other, so that they do not seem to move when the image of one plate is substituted by shifting the mirror for that of the other. But if there happens to be a single star among the hundreds which has moved in the heavens by a perceptible amount during the interval between the times at which the photographs were made. Its image will seem to jump backwards and forwards as the mirror is shifted, and this "blinking" or winking of the image is very conspicuous, and calls attention to the star at once.

Many stars with fairly rapid motion among their fellows have been detected in this way, but, with the exception of Professor Barnard's star in Ophiuchus (found by a very similar method), none compares in interest with Mr. Innes's discovery.

The first measures effected indicated that this star was moving nearly westward in the sky, at the very rapid rate of about five seconds of arc per year, exceeded by only half a dozen stars in the heavens. Moreover, the star was within about two and one-half degrees of Alpha Centauri, the nearest known star, and was moving in almost exactly the same direction, though at a more rapid rate.

This suggested at once that the new discovery was really a companion of Alpha Centauri, sharing its motion through space, and presumably at about the same distance; and measures to determine its parallax were at once begun by Dr. Innes with the nine-inch telescope of the Union Observatory, and by Mr. Voûte—a Belgian Astronomer working at the Cape of Good Hope—upon photographs taken separately there.

The results of both series of observations have recently been published. They agree in showing that the motion of the small star is almost exactly parallel to that of Alpha Centauri, and at nearly the same rate, while its parallax is nearly the same as that of its brilliant neighbor, and hence much greater than that of any other known star.

Mr. Voûte's observations (which, being made with a more powerful instrument, are probably the more accurate of the two), make the parallax of the star 0.76, corresponding to a distance of 4.3 light years. Mr. Innes's observations make the parallax 0.80, and the distance 4.1 light years. These two independent determinations agree as closely as might be expected and show beyond any possible doubt that we are dealing with an actual companion to the star which was previously supposed to be our nearest neighbor in space. It is probable, indeed, that our new acquaintance is a little nearer than Alpha Centauri itself. As so often happens now-a-days, it has been found on plates taken many years before it was discovered, and Mr. Innes measuring these plates (which were taken at Sydney, Australia), finds that the proper motion is 3.85 per year and is parallel within about a degree with that of Alpha Centauri, but a little more rapid, the latter being 3.68 per year. It appears probable, on the basis of our knowledge of other groups of stars which are moving together, that the real motions of the two stars in space are parallel, and at the same speed. If this is true, the newly discovered star, which appears to move a little faster than Alpha Centauri, must be correspondingly nearer; so that it seems likely that this tiny object may turn out to be the nearest star in all the sky. Within a couple of years, accurate observa-

tions should be available, which will settle the question.

The star is not only remarkable as being probably our nearest neighbor; it is also noteworthy as by far the faintest self-luminous heavenly body so far known. Visually, in the telescope, it appears as a faint object, of the 11th magnitude, that is, only $\frac{1}{10000}$ part as bright as the brighter star of the pair which compose Alpha Centauri. As the latter is known to be very nearly equal to our Sun in actual brightness, it follows that Innes's star is but $\frac{1}{10000}$ part as bright as the Sun. Even so, it must unquestionably be a star, shining by its own light. If it could be brought into our own solar system, and placed at the distance of Neptune from the Sun, it would appear to us on Earth as a dazzlingly bright object, 40 times as bright as Venus at her best, visible by day, and by night illuminating the whole landscape about as brightly as the thin crescent Moon. But, regarded in comparison with the other stars, it is faint indeed. Even Barnard's star—the faintest previously known—is about six times brighter.

As might have been expected of so faint an object, its light is very red, apparently even redder than that of

The Heavens

The winter constellations have now shifted to the southwestern sky, where Orion hangs high, with Canis Major on the left, and Taurus on the right. Gemini above Orion, Canis Minor above Canis Major, and Auriga above and to the right of Taurus, add to the brilliancy of the region, which is still further enhanced by the presence of Jupiter.

The southeastern sky is less brilliant, though. Leo is high and Virgo rising while Hydra rears up from the horizon, but Saturn, which is high up in Leo, and Mars, lower down in Virgo, add much to its interest. Arcturus has just risen, a little north of east, and the Great Bear is higher up and farther north. The Little Bear extends to the right from the Pole-Star, while Draco, Cepheus and Cassiopeia are all low in the north.

The Planets

Mercury is a morning star all through February, but is poorly placed for observers in our latitudes, being south of the Sun, and rising at 6 A. M. early in the month. During the latter half of the month he is nearer the Sun, and practically invisible.

Venus is an evening star at the beginning of the month, setting an hour later than the Sun, but she is drawing in very rapidly toward conjunction, which occurs on the 10th, and is soon lost to sight to reappear as a morning star toward the end of the month, when she becomes rapidly more conspicuous, till on the 28th she rises $1\frac{1}{2}$ hours before the Sun.

Mars is in Virgo approaching opposition and rises at 9.30 P. M. on the 1st, and 7.30 on the 28th. He is growing larger and brighter as he approaches us; until, by the end of the month, he is twice as bright as any star in sight except Sirius.

Jupiter is in Taurus, and is approaching his eastern quadrature with the Sun, which occurs on the 22d. He is visible till after midnight, and is the most conspicuous object in the sky.

Saturn is in Cancer, just past opposition and is visible almost all night. Uranus is in conjunction with the Sun on the 13th, and is invisible. Neptune is in Cancer about five degrees west of Saturn, and is well placed for telescopic observation.

The Moon is in her last quarter at 3 A. M. on the 4th, new at 5 A. M. on the 11th, in her first quarter at 8 P. M. on the 17th and full at 5 P. M. on the 25th. She is nearest the Earth on the 12th, and furthest off on the 27th. As she travels around the sky, she passes near Mercury on the 9th, Venus on the 10th, Uranus on the 11th, Jupiter on the 18th, Neptune and Saturn on the 23d and Mars on the 27th.

Princeton University Observatory.
January 21st, 1918.

The Draft and the Naval Reserve

THE general public appears to be under the impression that voluntary enrollments in the Naval Reserve Force ceased on December 15th, and that, after that date, all men of draft age, not previously enrolled in the Naval Reserve Force, are ineligible. This belief has caused the naval authorities considerable concern, in view of the fact that the Second Naval District is in need of at least fifteen hundred additional men for its Naval Reserve Force. Accordingly it may not be out of order to quote here an opinion rendered by the War Department and published for the personal guidance of the thousands of young men concerned.

It is here stated that Section 151, Selective Service Regulations, does not prevent registrants who may be placed in Class 1 from enlisting in the navy or marine corps after December 15, 1917. A registrant who has been classified in Class 1 may enlist in the navy if his liability order number is such that he is not within the current quota of his Local Board under a present call.

All officers and enlisted men of the naval militia, naval reserve, etc., are in the naval service of the United States. Accordingly the provision of Section 151, Selective Service Regulations, means that any registrant may enlist in the Navy or Marine Corps after December 15, 1917, upon presentation to a recruiting officer of a certificate showing that his order number is such (whether he be in Class 1 or in a deferred class), that he is not within the current quota of his Local Board under a present and existing call.



At 11 o'clock: Feb. 6
At 10 $\frac{1}{2}$ o'clock: Feb. 14
At 10 o'clock: Feb. 21

At 9 o'clock: Mar. 7
At 8 $\frac{1}{2}$ o'clock: Mar. 15
At 8 o'clock: Mar. 22

At 9 $\frac{1}{2}$ o'clock: March 1

NIGHT SKY: FEBRUARY AND MARCH

Barnard's star, so that it is almost in a class by itself. It is evidently a very cool star, at the very limit of temperature at which a star can be said to shine at all, and it is on this account that it is so faint, just as a bit of red hot iron, in a dark room, would not shine with anything approaching the brilliancy of a piece of white hot metal of the same size.

Concerning its real size we can only guess; but, from its extreme redness it seems probable that it gives out only something like a thousandth part as much light per square mile of surface as the Sun does, in which case its diameter would be something like a quarter of the Sun's. Though this estimate is very doubtful, it serves to show again that the body is really a star, and that it probably far exceeds in size and mass any of the planets of our system.

The distance of this tiny star from Alpha Centauri must be at least ten thousand times that which separates the Earth and Sun, and may be considerably greater if, as been suggested, it is the nearer to us of the two. Assuming an actual distance of 15,000 astronomical units, it follows that, as seen from Alpha Centauri, or from a planet revolving around it, the faint star would appear to be between the fourth and fifth magnitudes—that is easily visible, but not conspicuous, to the naked eye. Alpha Centauri itself, seen from the companion, would be a brilliant object indeed—the brighter component being about five times as bright as Venus, and the fainter one equal to Venus at her best, while the two would be, on the average, about five minutes of arc apart, so that they could be separated by the naked eye—if eyes like ours could be imagined there.

Mechanical Equipment of the Farm

Latest developments in agricultural machinery and practical suggestions for the farmer

By HARRY C. RAMSOWER, Professor of Agricultural Engineering, Ohio State University

Hot and Cold Water in the Farm Kitchen

ANYONE who has even a passing familiarity with the development of the American farm and farmstead knows it to be a fact that the equipment of the barns and the fields has been carried to a point far in advance of the equipment of the farm home. For forty years and more educational institutions, experiment stations, the farm press, all agencies in fact, interested in better farms and better farming, have emphasized the necessity of more fertile soils, better crops, better livestock, more and better machinery. It is well that such should have been the case. But have we not reached that stage in the development of the farm home where more attention should be given to the installation of such equipment as shall make for convenience where convenience has been shamefully neglected?

Not the least of the improvements to which I refer is that of a convenient water supply system. We have been too long contented to carry the day's supply of water for household use from the cistern outside the house, from the well to the barn, or from the spring yonder at the foot of the hill, forgetting that with a small outlay of time and money we might make it possible to save those few minutes each day which aggregate hours each month. You may not be able to supply yourselves with a complete system of hot and cold water costing from \$250 to \$300. But let me describe a simple system that is quite within the reach of at least eighty per cent of the farm homes of America and which will mean so much to all members of the home, particularly the women. The details of this system were largely worked out by Prof. W. A. Etherton, formerly of Kansas Agricultural College.

It consists essentially of a kitchen sink, a pump, a range boiler, some device for heating the water in the boiler, and a few feet of pipe with the necessary valves and connections. The sink may be of the ordinary type, but the one shown in the accompanying photograph is very much to be preferred. It is a rolled-rim porcelain-lined sink with a back. The back makes it so much easier to keep the sink and surroundings clean and presentable that it is well worth the extra cost. When a sink is installed, let the housewife determine how high it should be placed. The average carpenter will place it 30 inches above the floor. It should generally be 34 inches high, so that one washing in it will not find it necessary to stoop.

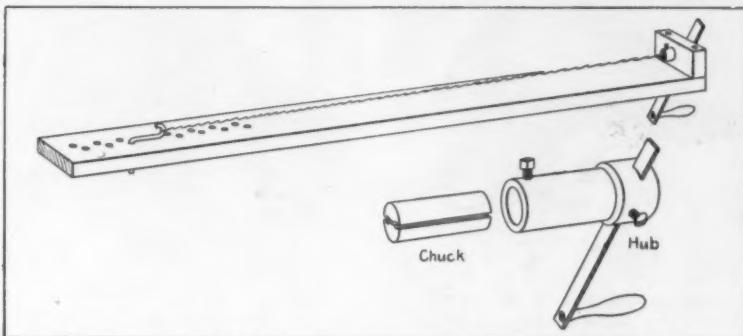
The pump is a kitchen-sink force-pump. The type shown has a brass cylinder. The air chamber is attached to the pump spout. The boiler feed-pipe leads from the pump to the range boiler, entering the boiler at the top and extending nearly to the bottom as shown by the transparency in the figure. At the point where this pipe connects to the pump spout there is placed a three-way valve with handle and pointer attached. The hot water pipe is taken from the top of the boiler and brought to the pump spout as shown. An air cock is placed in both the boiler feed pipe and the hot water pipe; in the former pipe it is placed in the horizontal line near the boiler, in the latter pipe it is placed in the vertical line near the pump.

The range boiler has a capacity of 30 gallons and is shown mounted on an adjustable stand. The bottom of the tank is placed on a level with the sink, to utilize the syphon principle to the fullest extent. The boiler may be placed at any convenient distance from the sink; in fact, it may be located in an adjacent room if desirable.

In the average farm home the water is most conveniently heated for at least nine months in the year by attaching the boiler to a "water-front" in the fire-box of the range. All companies manufacturing stoves make water-fronts which can be easily attached. A water-front may consist merely of a coil of one-inch pipe placed in the fire-box and attached by two leads of pipe to the boiler. Or it may be a simple rectangular iron box placed in the range. The former type provides a larger heating area, but burns out rather quickly if hard water with a large lime content is used.

A kerosene heater is being used in the equipment shown. This is an admirable substitute for the water-front during the hot summer months. The boiler connections to the water-front can be removed

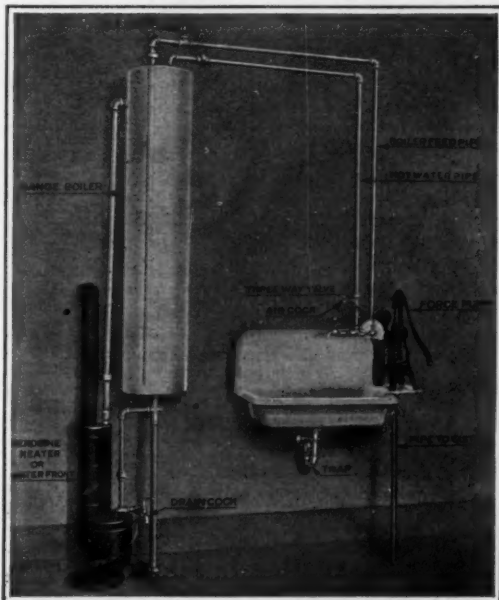
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Home made device for twisting wires for concrete reinforcement

Reinforcement for Concrete Posts

THE accumulation of old fencing wire about most every farm furnishes a source of cheap reinforcement for posts or other reinforced concrete, provided of course, that it is not rusted or tangled too badly. As ordinarily taken, this wire would be too crooked to be placed accurately in a post mold and would hardly be worth the time necessary to hammer it out straight. But, by a process of twisting, such wire as this can very easily be made into a straight, flexible and satisfactory reinforcement which serves very well in a concrete post. The twisting has not only the effect of straightening the wire, but it acts as a test on the wire in that weak places are liable to be broken in the twisting process, which may also

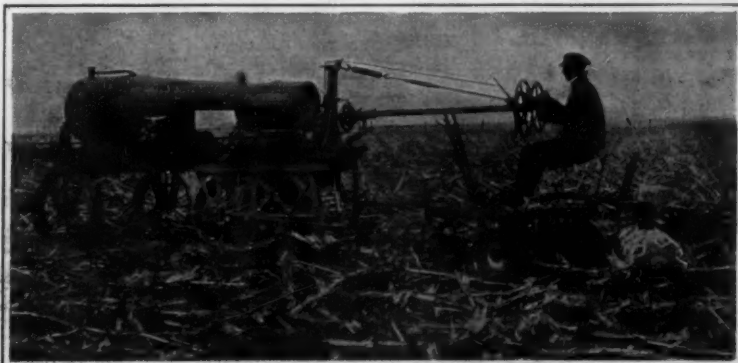


Inexpensive hot water system for the farm

loosen some of the dirt and rust that might be adhering.

A simple homemade device for twisting wire into post reinforcements is shown in the accompanying illustration. The base for this device is a two by eight-inch plank about nine feet long. At one end is bolted a support for the crank which turns the chuck into which the wire is clamped. At the other end of the plank are a number of holes alternating on each side of the center and placed about an inch apart. Into these holes is dropped a sort of hook which holds the loop end of the wire.

To make a reinforcement for a seven-foot post, then, take 14 feet of No. 9 wire, clamp the two ends in the chuck, hook the loop of the wire with the special hook and place it into the hole that will pull it up the tightest.



The steel mule at work

The slack and crookedness in the wire will then be taken out by the twisting which is done by turning the handle.

The chuck is perhaps the hardest part of the device to make. The writer made a chuck from a 2½-inch piece of 1½-inch steel shafting which was fitted into the handle and hub taken from a press drill. The set screw on the hub served both to hold the chuck and to clamp the wire. Two holes the size of the wire to be twisted were drilled into the end of the piece of shafting about two inches deep. Then with a hack saw the piece was split nearly to the other end. The ingenuity of the mechanic will be able to adapt this idea to any special case where the design illustrated cannot be followed.

The twisted reinforcement rod made from two strands of No. 9 steel wire will be found more satisfactory than the ½-inch round rods that are often recommended, the writer believes. The twist in the wire permits of a better grip by the concrete and the twisted rod is also straighter and more flexible and is therefore more easily placed in the mold. There is also a saving of nearly a pound of steel to the post, where the wire is used. The two No. 9 wires furnish ample reinforcement for a square section post about four by four inches or four by five inches in size, where a reinforcement is placed in each corner. Probably the least reinforcement that could be used in such a post would be two No. 12 wires twisted together for each corner. Where old wire is used, that may be rusted, some allowance must be made for its lack of strength and perhaps four of the wires should be twisted instead of two.

A Steel Mule That Drives Like a Horse

By J. M. Bird

THE only function that the horse performs in farm work is that of furnishing a means of pulling the machine along—that's the reason he is hitched up in front, where one can watch him and guide him while the implement is getting the ground or the crop into shape. Ordinarily, when auto-motive power is substituted for the horse, the power plant is mounted right on the machine with which it is intended to be used, since this seems by all means the natural and economical way. Why have two machines, one to work and one to pull, when one will suffice?

This question would be an unanswerable one indeed, if one machine would by any possibility suffice for all agricultural work. But unfortunately, it won't; the farmer has to have plows and harrows and cultivators and reapers and other apparatus; and if he were asked to buy a separate power plant with each it is very plain that mechanical farming wouldn't get very far. But even as things are, there is often objection to the purchase of a big tractor to haul the farm machinery about; for it takes at least one man to run the tractor and one to operate the trailer, as against a single man for most horse-drawn machinery of the types met on the small farm. Here is where the steel mule comes in.

This is just what its name implies—a draft horse of metal, that eats gasoline and kerosene instead of hay and oats. The steel mule simply goes where the horse goes—up in front of the trailer, where one can watch and guide it while the implement does the work. There is hardly an implement on the farm of today that cannot be hitched to and hauled by the steel mule; and it goes without saying that under ordinary circumstances, where the ability of the horse to govern better its instantaneous output of energy is not called on constantly, more work can be obtained out of the steel mule in a day than out of three span of big husky horses.

The control wheels are arranged so that the steel mule can be completely driven from the seat behind, just like a horse. The small wheel at the end of the column is used for shifting the transmission gears, a slight twist changing the speed to suit the work under way. The middle wheel is used for steering, which is of the irreversible worm and nut type. The steering arms are so designed that not only can the tractor turn in a space less than that required for five horses, but that the muscular effort involved in guiding this machine is far less than that used with any automobile made. The largest wheel serves two purposes; it disengages the clutch and locks it by means of a simple ratchet mechanism.

(Concluded on page 119)

Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Steel Helmets of the Swiss Army

FOLLOWING the example of practically all leading armies, the military forces of the Swiss Republic have recently adopted a new steel helmet for use under actual battle conditions.

The new Swiss helmet is a compromise between the French and the German helmets. As far as attractive appearance is concerned, it is much like the French *casque*; but the downward curve at the rear with added protection to the back of the head and neck is typically German. The Swiss helmet has been designed by the noted Swiss painter and sculptor, M. Charles L'Eplattenier, in accordance with the experience of other armies in the war. The peak, which projects in front well over the forehead, is ornamented with the Federal Cross. The eyes and nose can be further protected by an adjustable visor. The helmet weighs about two pounds and is lined so that it can be worn at any angle.



Helmet designed for the use of Swiss troops



New Swiss helmet with visor for added protection

Under the terms of the Convention, the Central Bureau at Havana will be organized, and it will now be possible for American merchants and manufacturers to protect their trade marks in the countries which have ratified the Convention, at very little expense.

It is possible under the provisions of the Convention to have a trade mark entered on the records of the Havana Bureau and thereby automatically obtain not only all the required protection for the trade mark in question in the countries which have ratified the treaty but also in Mexico, Salvador and Haiti, the other coun-

tries of the northern group when the Convention is ratified by these countries.

Notes for Inventors

Starting the Roll of Wrapping Paper.

—The end of a roll of wrapping paper has the extremely annoying habit of adhering to the roll so that some time is lost in locating it and then prying it loose. To

overcome this difficulty a clever attachment has been recently patented by Antoine T. Bousquet of Worcester, Mass. His device consists merely of a paper-edge starter which is fastened in any convenient manner to the frame of the usual cutter bar. The paper-edge starter has a toe which presses on the paper roll and which when a piece of paper is to be torn off, does not interfere with the usual procedure. However, after the paper has been torn off the roll is turned and the freshly-cut edge is picked up by the toe and held in a convenient position for immediate use. The device should prove a great time saver in busy stores.

An Insulated Shovel.—Where laborers are at work, on an electric railway of the third-track class there is always danger if ordinary tools are employed. For the touching of the third rail with a pick, shovel or crow bar may lead to fatal results. A New York inventor, Daniel L. Braine, has recently patented a tool which is insulated for the purpose of protecting the workman on electric railways. In the case of the usual shovel, Mr. Braine places an insulating sleeve over the metallic straps which connect the blade with the lower part of the handle, so that there is no possibility of grounding the current through the workman should his tool come in accidental contact with the "live" rail. Furthermore, he makes use of an insulating material of some distinct color, which is an additional precaution.

Arsphenamine.—Regulations concerning licenses to manufacture and sell the product heretofore known under the trade names "salvarsan," "606," "arsenobenzol," and "arsaminol," issued in November by the Federal Trade Commission, require that hereafter this preparation shall be manufactured and sold under the new name "arsphenamine." On labels this abbreviated chemical name is to be followed by the descriptive chemical name. The drug must be offered for sale only in colorless glass ampules containing an atmosphere of an inert gas. No names of diseases or symptoms are to appear on any label or package. The regulations also provide certain limits for the total arsenic content and prescribe other pharmaceutical requirements. Tests of all brands will be made from time to time by the Public Health Service.

Band Brakes for Aircraft.—A British patent has been recently secured by T. J. Connor of Failsworth, England, on a brake band for the landing chassis of airplanes. According to the invention, the landing wheel hubs are provided with tubular extensions on the inner sides, which revolve within relatively fixed casings. Within each casing and between the same and the respective tubular extension is a substantially spiral-shaped band one end of which is anchored to the casing, while the other projects through an opening or enlargement in said casing, and is acted upon by a manually-controlled member so as to cause it to tighten the band on the tubular extension, the band being so arranged that immediately it grips the hub extension the rotary movement of the latter tends to wrap said band tightly thereon, causing powerful braking with a minimum force.

Novel Automobile Accessory.

—Among many clever exhibits at the recent automobile show held in New York city, was a clear-vision windshield consisting merely of a glass disk rotated at high speed by a small electric motor.

Toyland Tank

EVEN Young America is alive with the military spirit of the day. No longer content to play with building blocks and toy railroads and other peaceful things, the American youngsters are now playing with rifles, machine guns, cannon, military equipment and even tanks.

The toyland tank shown in the accompanying illustration is typical of those now being made for American youngsters. In this case it has been constructed by the little fellow's father, Jack Sussman of Brooklyn, N. Y. during odd moments. It is provided with movable tractor belts and swiveled guns after the fashion of its full-sized counterpart. When pulled or pushed the tractor belts move in the most realistic manner.

Where Gravity Acts as Lamplighter

THE motorist need no longer store away in some corner of his consciousness the reminder that the law requires him to turn on the tail light of his car at 17 minutes past 6, when the sun sets. The device which we illustrate will not only remember it for him, but will actually attend to the business of turning on the "juice." It is only necessary for human agency to set the hand on the dial to the appropriate hour and minute. This done, the owner may leave the car unattended, secure in the knowledge that when the time rolls around his tail light will flash out.

The dial and all the mechanism are mounted on the dash, in the vertical position shown in our photograph. Under the pull of gravity, the weight shown on the piston walks down the rack on which it is mounted, but by virtue of the resistance engineered by a coiled conical spring in the cylinder it can only proceed at a rate which makes the entire descent consume 24 hours. At the time set on the dial it closes a contact which throws on the tail light. When it reaches the bottom it makes another circuit which, acting through the same conical spring, throws it up to the top to begin all over again. The only cost of operation is that of the batteries in the two circuits, and this aggregates the staggering sum of two cents per annum, according to the makers.

The same principle is utilized in an invention to turn on and off the lights of electric signs, illuminated billboards, or any other unattended light that should burn for a certain period. It is made in the form shown in the figure, and in addition in forms with two or more hands on the dials, to turn the light on and off again, once or even several times. Plainly the possibilities are endless, and it is of course not to be compared in operating expense with devices which make it necessary to keep a regulating circuit in continuous action.

The Pan-American Trade Mark Convention

AFTER a delay of eight years, the provisions of the Pan-American Trade Mark Convention have been ratified by the United States, Cuba, the Dominican Republic, Honduras, Nicaragua, Costa Rica, Guatemala and Panama, eight of the 11 countries which form the northern group.



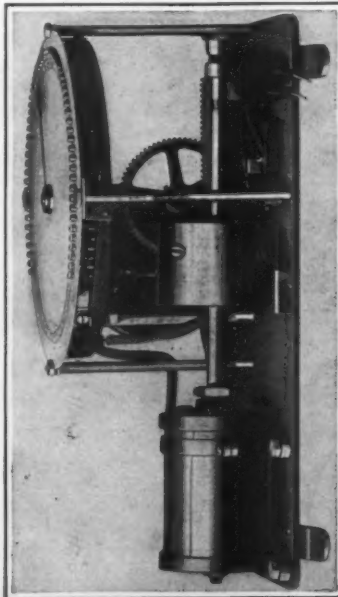
A toyland tank and its youthful commander

tries of the northern group when the Convention is ratified by these countries.

The International High Commission will make renewed efforts to have the Convention ratified by the South American countries so that the Bureau at Rio de Janeiro may be organized for the countries which form the southern group. When this is accomplished, the registrations which are obtained at the Havana Bureau will be extended to the Bureau at Rio de Janeiro, thus affording protection not only in Central America and in portions of the West Indies, but also in the South American countries. Nevertheless, it is necessary to remind manufacturers and merchants who are selling



A model with two hands, for turning the lights on and off again



Lamp-lighting device run by gravity and the clock

Troy Trailers

Troy Trailers make "motor truck trains" possible and profitable on hauls up to 100 miles.

On average roads any good truck can carry its full rated load and pull at least as much again on a Troy Trailer. In other words, the tonnage moved per trip on the Troy Trailer increases the load at least 100%, but at an increased cost of only 10% to 25% over operating the truck alone.

The Troy Trailer train is never stopped by freight embargoes or by Priority rulings. It makes a sure, dependable, economical freight service.

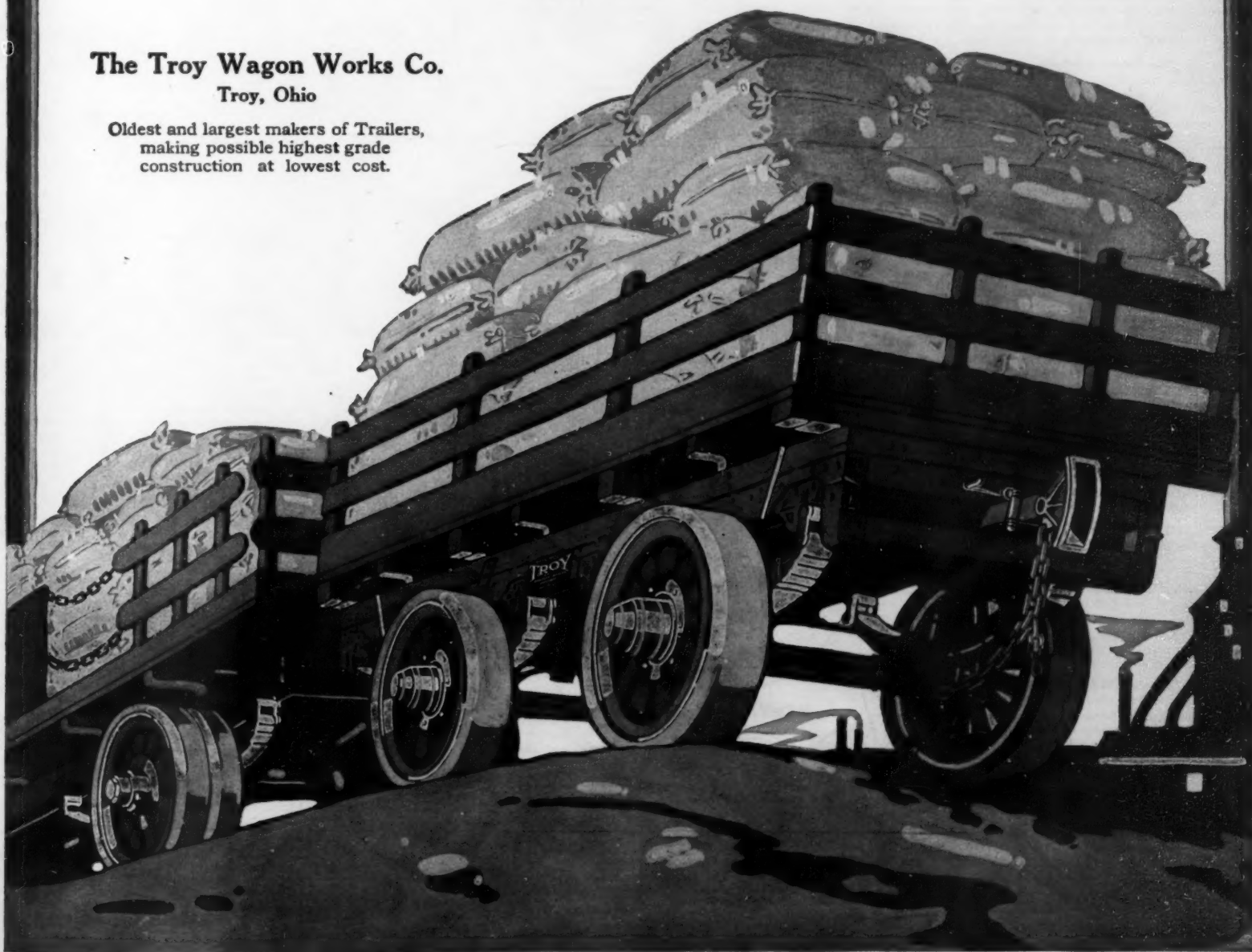
Dependable Deliveries

On short hauls, Troy Trailers have just as important a place. In retail deliveries—in construction work—around industrial plants—in fact, in every kind of business hauling, Troy Trailers are cutting costs, speeding deliveries and bettering service.

Made in capacities from 1 to 5 tons, and with any type of body desired. In design and construction Troy Trailers equal the finest truck you can buy.

The Troy Wagon Works Co.
Troy, Ohio

Oldest and largest makers of Trailers,
making possible highest grade
construction at lowest cost.



RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel

SHOE.—H. MEYER, 229 Winant St., Port Richmond, S. I., N. Y. This invention has for its object to provide a construction whereby the principal part of the shoe may be made from a single blank. A further object is to provide a shoe from canvas or other flexible material which is waterproof and shaped to fit the foot after which a sole is applied for holding the parts in their proper position.

COAT BRACE.—B. NEWBURGER, Richman Newburger & Travers, 332 Broadway, New York N. Y. Among the objects of this invention is to provide for a coat a brace adapted to extend around and embrace both shoulders and have connecting means extending across the shoulder blades acting to simultaneously draw the shoulders back, and the wear into erect form, and at the same time provide means to bear against the points of the shoulder blades so as to comfortably press them inwardly with sufficient force to keep the back in proper form.

SUSPENDER LOOP.—J. W. STEVENSON, Portland, Ind. One of the principal objects is to provide a loop having one or both of its arms resilient so that when engaged over the shank of a button sufficient give in the arms may be had in order to allow the loop to snap over the button the resilient arm immediately resuming its former position in order to prevent accidental displacement of the loop relative to the button.

GARMENT.—B. L. LAVIGN, 36 Green St., New York, N. Y. The main object of the invention is to provide bloomers for girls, such as are worn in gymnasiums, which can instantly be converted into a skirt of conventional appearance, by the use of this combined device the necessity for a girl to carry her bloomers to and from the gymnasium is avoided.

CORSET ATTACHMENT.—SADIE SCHAEFER 1358 Bedford Ave., Brooklyn, N. Y. Among the principal objects which this invention has in view are, to restrain the flesh of a wearer adjacent the upper edge of the corset when in service, the attachment being applicable to corsets of conventional design and structure, it is also adjustable to the figure of the wearer.

BLOOMER SKIRT.—M. PHILIP, 12 W. 21st Street, New York, N. Y. The inventor relates particularly to a child's garment, the object being to provide a construction whereby the garment may be arranged for use as a skirt or as bloomers, the fastening means may be used for holding this combined skirt and bloomers, in proper position as a skirt, or as bloomers, means are provided for dividing the skirt into sections, and for puckering each section or leg to produce a bloomer effect.

Electrical Devices

SPARKING PLUG.—T. E. PONDOE, Paris, France. The invention has for an object the production of a sparking plug which is of very simple construction, does not include any packing of asbestos, and is constructed in such a manner as to permit not only good insulation of the central electrode, but also cooling of the upper part of the plug, and more especially of this central electrode, by establishing an air current through the plug, about the electrode.

SPARK PLUG.—F. E. WALKER, Beaver Creek, Minn. This invention has for its object to provide a plug, wherein the electrodes are so arranged and placed that they will be free from grease, soot and sediment, while at the same time they will furnish a spark of the character required to provide good ignition.

ELECTRICAL OPERATING MEANS FOR DOORS.—J. R. KAISERMAN, Livingston, Mont. This invention relates to electrical operating means for doors whereby the door is opened by an electric motor, the circuit of which is controlled by a knob, latch or other device, and in the opening of the door a spring is wound, which serves as a closing motor, there being means for permitting the door to be opened by hand if the power should fail, an arrangement is provided whereby the door is prevented from closing too rapidly under the energy stored in the wound spring.

ATTACHMENT PLUG FOR ELECTRIC WIRES.—C. F. TORAN, 173 N. Main St., Springfield, Mass. The principal object of the invention is to provide a plug for extension wires, lamps or other electrical appliances adapted to cooperate with a screw threaded standard socket, the connection being made by a simple push of the plug into the socket, providing for a direct pull upon the wire for releasing the plug without danger of disconnecting the wires.

Of Interest to Farmers

SILLO.—B. H. SHILLING, Knox, Ind. The invention relates more particularly to a metal silo construction of a take-down portable nature; The object is to provide a jointed construction, having means whereby the joints may be rendered water- and air-tight and their connection and disconnection readily and quickly effected. A still further object is to provide a jacket surrounding the tank, and providing for the reception of a layer of insulating material, to prevent the contents of the tank from freezing.

STOCK WATERER.—F. H. PAGE, Waverly Iowa. The object of the invention is to provide a stock waterer disposed in a reservoir, with walls of the drinking trough spaced from the walls of the reservoir, and with an inlet from the reservoir into the drinking trough so that when the trough

is opened the water in the reservoir will not be materially effected by the outside air. Another object is to provide a heater with two tubes leading to and from the drinking trough to keep the water at an even temperature.

TRACTOR.—A. G. OLSEN, care of Olsen Concrete Mixer Co., Elkhorn, Wis. One of the main objects of the invention is to provide means for steering the drive wheels whereby very sharp turns may be made. The device is simple in construction and use, it is composed of few parts likely to get out of order, and one man may control both the tractor and the vehicle or implement drawn thereby.

HEATING SYSTEM.—G. Q. RILEY, Corona, Cal. The object of the invention is to provide a heating system for orchards and the like, to prevent injury to the trees from frost, the system is a permanent arrangement having means adjacent to each tree for raising the temperature of the air about the tree above the point where the tree would be injured, the heat being provided by an electric current thus permitting the system to be controlled at a distance.

GRAPPLE FOR HAY LOADERS.—T. ARAKI, Fromberg, Mont. The invention relates to a portable apparatus for loading hay or the like, and is more particularly extended for use in loading material from a stack into a vehicle. The grapple is adapted to be suspended from an overhead boom, it is equipped with a series of grabs alternately short and long each grab has a line, the grabs are pivoted for radial swinging there is a movement to close and open the grapple when grabbing and depositing a load.

APPARATUS FOR PREPARING FRUIT FOR SHIPMENT.—T. J. PETERS, Peters, Fla. The object of the invention is to provide an apparatus for treatment to retard or hasten the ripening of tomatoes and other fruit, so that the tomatoes or fruit of the same maturity may be shipped for a short or long distance, to near or distant points, and arrive at each of the said points at substantially the same stage of maturity. Another object is to wash the tomatoes or fruit and treat them to destroy bacteria or fungus thereby preventing any decay during shipment.

WEED PULLER.—H. C. JOHNSON, Fort Bragg, Calif. One of the principal objects of this invention is to provide a weed puller by means of which weeds may be extracted from lawns or gardens without the necessity of having to bend over or stoop in order to get at the weeds. Another object is to provide a weed puller including a blade or scoop for engaging the weed upon sinking the scoops in the earth alongside the weed to grasp the weed for extracting it.

Of General Interest

AUTOMATIC BURGLAR & FIRE ALARM.—J. P. RUMPF, 618 E. Fayette St., Baltimore, Md. The invention has for its object to simplify the construction of burglar and fire alarms, and to provide an inexpensive device which shall be reliable in operation and capable of automatically ringing a bell or alarm in case of an attempt to enter the house or in case of fire or over-heating of a furnace.

REPRODUCER.—W. T. LAKIN, Long, Md. This invention has for its object to produce a device, wherein the stylus bar is mounted parallel with the diaphragm, and is supported in knife edge bearings and points; to give it the greatest possible freedom of movement, which influences or accentuates the diaphragm.

AWNING.—L. A. HOWE, Waukon, Iowa. The invention has for its object to provide a frame for supporting awnings, and arms extending laterally from the body and hinged to the casement of the door or window, the arms being sectional and the sections being connected by a rule joint to permit the joint to fold downward but to limit the upward movement of the joint to a position where the sections are in alignment, together with a flexible member for assisting in raising and lowering the frame.

ROAD BED.—G. SCHLEICHER, 105 E. 14th St., New York, N. Y. Among the principal objects which the invention has in view are: To provide a road bed having relatively hard tracks, to provide tracks or runways for special service, to provide paving blocks for the accomplishment of this purpose, the blocks being arranged to overcome instability, and to avoid sub-surface wear, and to control the traffic on public roads.

BAG CARRIER.—M. J. BIRD, 217 Hunt St., Central Falls, R. I. The invention relates to a device adapted to be applied as a handle to a paper bag, and includes means to engage the folded mouth of the bag. In its entirety the invention

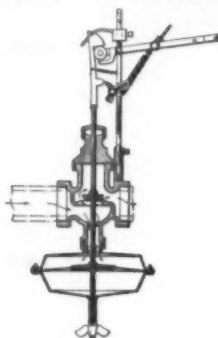


PERSPECTIVE VIEW OF THE DEVICE ATTACHED TO A BAG

includes a stiffener bar adapted to be unfolded by the folded mouth of the bag and to be received with the bag folds in the gripping member of the handle.

CARTRIDGE.—S. ROGEEA, 91 Boulevard St., Germain, Paris, France. This invention relates to fire arms and more particularly to the cartridges to be used with such arms, it has for its object to provide firstly a cartridge the projectile of which is adapted to acquire in passing through the barrel of the arm rotation around its axis even when such barrel is not rifled, secondly, a cartridge the projectile of which is loaded with powder and so fitted that the charges will burn gradually and in opposite directions during the travel of the projectile through the barrel, thirdly a projectile adapted to produce on falling peculiar effects of rebounding and level shooting.

SAFETY GAS VALVE.—T. A. BROOKS, address, Clarence Spooner, Atty. Newton, Kans. The invention relates more particularly to a valve having means whereby to bring the same into action for closing off the gas passage when the



VIEW SHOWING THE PARTS IN POSITION UNDER NORMAL GAS PRESSURE

pressure of the gas falls below or increases above certain pre-determined limits, the object being the provision of a simple and inexpensive arrangement applicable to the usual type of valve and capable of effective operation.

ORANGE HOLDER.—J. A. LUNDAHL, Charlotte, Rochester, N. Y. The invention relates to an individual holder for oranges, grape-fruit or the like, its prime object is to provide a holder so constructed and arranged that the individual portion of fruit will be firmly held by the holder against accidental displacement and may be placed and removed with facility.

SHIP'S TABLE RACK.—J. J. KANE, 102 Front St., New York, N. Y. The invention has for its object the provision of a construction for preventing dishes on a table from shifting to any considerable extent when the ship is being tossed. Another object is to provide adjustable side guards which may be raised or lowered, and a plurality of divisions, whereby various persons using the table may retain their dishes in their immediate vicinity.

CHANGEABLE SIGN.—A. HOLDER, 2208 So. Main St., Los Angeles, Cal. This invention has for its general object to provide a form of letter unit and background on which the units are removably mounted, whereby the sign can be changed from time to time as required. A more specific object is to provide a sign having simple and effective means for locking the letter units in place.

FLUID PRESSURE GAGE.—L. V. CANTRELL, 214 So. Wichita St., Wichita, Kans. Among the principal objects which the invention has in view are, to provide means automatically for determining the supply of fluid to accord with



SECTION OF A GAGE ARRANGED WITH PRESENT INVENTION

the pressure in the receptacle therefor, to provide means for prearranging the condition under which the apparatus operates, and to provide a simple and efficient mechanism for accomplishing the purposes above mentioned.

SAFETY PIN.—B. L. FROEHLI, 244 W. 113 St., New York, N. Y. The invention relates to safety pins of the "lie flat" type, as disclosed in Patent No. 849,217 granted, April 2d, 1907. In this type of safety pin the back member is provided with an offset or hump between its ends so as to provide sufficient clearance between the thrust and back members to accommodate the cloth. The object of the present invention is to provide this clearance between the thrust and back members without resorting to the hump or offset portion and leaving both of such members straight or substantially so.

PUMP.—C. M. SEARS, Derby, Colo. The object of the invention is to provide a pump more especially designed for use in wells, mines and other places from which water or other liquid is to be raised to a desired height and which is simple and durable in construction, composed of comparatively few parts not liable to get easily out of order.

CAMERA.—W. D. BLAIR and W. J. WRIGHT, care of Davidson and Beattie Medicine Hat, Alberta, Canada. The object of the invention is to provide a camera which is constructed in such a manner that it will prevent the possibility of a double exposure, and which will automatically move a new film surface to operative position after each exposure. Other objects are to provide means to indicate the number of exposures which have been made, and means for holding the film in position, under tension while making the exposure.

STRETCHER.—E. CHASSAING, Paris, France. The invention relates particularly to a form of stretcher which can be easily sterilized between two transportations, and on which a wounded or sick person can be placed without any shock. The object of this invention consists in mounting the canvas on the stretcher by means of a flexible beading arranged on the two sides of the canvas which is slid into two grooves of equivalent form, formed on the longitudinal members or poles of the stretcher.

TIMING DEVICE.—W. H. FRIDLEY, care of J. S. Fribley, Aberdeen, Wash. The invention relates to means for timing intermittent operations of different kinds, particularly for timing the exposure of sensitive paper to be used in a photographic printing machine, which is the subject matter of Patent No. 1,246,579 granted to the same inventor. One of the main objects is to provide means for insuring definite intervals between operations, for varying the duration of the intervals, for limiting the number of operations, and for rendering the operation of the apparatus with which the invention is connected inoperative after the desired number of operations has been accomplished.

METHOD FOR PURIFYING AND HUMIDIFYING AIR.—A. W. LISBAUER, address E. Horwitz, 115 Broadway, New York, N. Y. An object of the invention is to supply air kept automatically at a constant moisture content irrespective of variation of dry-bulb temperature. Another object is to provide a simple method whereby air may be kept at a constant saturation temperature or absolute humidity, by the action of devices affected by the initial and final moisture and total heat of the air.

ROLL SCREEN FOR WINDOWS.—D. EDWARDS, 1260 74th St., Brooklyn, N. Y. The object of this invention is to provide a roll screen arranged for convenient attachment to windows without requiring alteration thereto, and adapted to properly screen the window from top to bottom and from side to side to prevent insects from passing into the room and to allow convenient rolling up of the screen for opening or closing the window sashes. Another object is to combine with the roll screen supports for a window shade and curtain pole.

WATCH WRISTLET.—A. L. ROSENTHAL, 10-14 East 12th St., New York. The invention relates particularly to what is termed a wristlet for holding watches in place on the wrist of a person, and has for an object a construction capable of easy adjustment for accommodating watches of different sizes. Another object is to provide a pair of encircling members telescopically fitted together and arranged to be automatically adjusted as the straps are tightened.

PROJECTILE.—W. R. MOORE, P. O. Box 5 Fayetteville, Ark. The invention has for its object to provide a projectile for field, siege, coast and other guns, having wings which will open when the projectile leaves the gun to prevent tumbling, the wing arms to which the wings are secured being held close to the projectile by the powder shell when the projectile is introduced into the breech of the gun. When this shell is used, there is practically no friction against the rifling of the gun, and a longer range is obtained.

CONDENSER.—F. H. LULL and E. C. WANNER, address Ludd-Wanner Corp., care of J. L. Rohleder, Norfolk, Va. This invention relates to distillation, as of water or other liquids, mashes and the like, one of the main objects is to provide a condenser adapted to be superposed upon an ordinary kitchen utensil, such as a kettle, a further object is to provide for rapid distillation by the provision of a water-jacket and means for insuring a circulation of cool water therethrough.

BOTTLE-HOLDER.—C. A. FOLLY, Boonton, N. J. The invention relates particularly to a holder for milk bottles, and has for an object the provision of a construction whereby as the bottle is delivered to a customer it is automatically locked in the holder against removal until the customer has opened a door or window adjacent thereto.

FUNNEL AND GAGE.—J. B. BURKETT, Levita, Texas. This invention has for its object the provision of mechanism especially adapted for use in filling storage batteries, wherein means is provided in the form of a float and scale for indicating when the proper amount of water has been inserted in the battery. This can easily be ascertained and when once known the batteries may be filled to the proper point without any danger of adding too much or too little water.

EXTENSION TABLE.—C. NELSON, Toledo, Oregon. The object of the invention is to provide a table wherein the intermediate or filling leaves are sectional, and the sections are hinged together and to the table in such a manner that the sections may be folded upon each other and dropped downward within the frame of the table to permit the end sections to close together, and wherein folding legs are provided arranged to unfold when the table is extended to support the ends of the table.

(Continued on page 114)

CONCRETE ROADS



When the Call Came for More Ships

The CONCRETE ROADS of Snohomish County, Wash., were ready for immediate hauling, by motor truck, of millions of feet of timber for ships and airplanes.

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CONCRETE FOR PERMANENCE

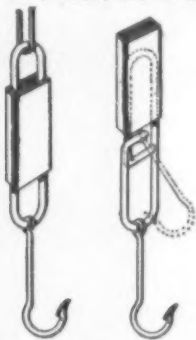
RECENTLY PATENTED INVENTIONS

(Continued from page 112)

BILL POSTING BLANKING DEVICE.—P. GALLIA, Gainesville, Texas. The invention relates to bill posting particularly with respect to the requirement that every poster have a border of white paper around it. As posters are often of considerable height and length a great deal of trouble is experienced in getting the blank strip in place, especially in a high wind, to overcome this the invention provides a device for holding a roll of paper strip, the strip being secured in place by the brush as it is unrolled, there is no free paper to flap in the wind or get twisted.

ARRANGEMENT OF SHIP RUDDERS.—G. Po. Rome, Italy. The object of the invention is to improve the evolutionary qualities of a ship's rudder and to lessen the danger ensuing from rudder damages in navigation. By the improvement of this construction, dangers of collision or stranding may in the majority of cases be avoided or diminished.

FISH HOOK ATTACHMENT.—J. JOHANSEN, care of Nelson and Storey, 608 Tower Ave., Superior, Wis. This invention relates particularly to means for attaching a fishhook attachment to a snell, leader, line or the like. An



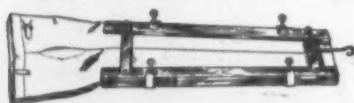
SHOWING PARTS ARRANGED TO RECEIVE THE HOOK, AND THE DEVICE READY FOR USE

important object is to provide a device which may be securely attached to a fishing line and when attached may be easily and quickly operated to change hooks or entirely detach them. The device is simple, durable, and inexpensive to manufacture.

SAFETY RAZOR.—I. N. WEBER, 575 West End Ave., New York, N. Y. Among the objects of the invention is to provide a safety razor of peculiar form and construction adapting it for convenient carrying in the pocket, the entire construction being no thicker and but slightly broader than an ordinary lead pencil, while the length is materially less than that of a pencil.

ADJUSTABLE EGG-TRAY STOP.—H. W. LODGE, Towaco, N. J. The invention relates to an attachment for incubator egg trays, it being in the nature of a stop for holding the eggs compactly together when the tray is only partially filled, so that the entire lot of eggs can be turned at once into another tray without the individual eggs promiscuously turning. It is comparatively simple and of inexpensive construction.

TROUSERS CREASER.—H. ROSENTHAL, care of A. Schlesinger & Son, 35 E. Houston St., New York, N. Y. Among the principal objects which the invention has in view are: to maintain the crease formed in trousers during the period



TROUSERS CREASER

when they are stored, to provide an apparatus which is simple in construction and which may be reduced to a compact form, to provide means for hanging the apparatus and trousers and to avoid glossing the trousers when creasing them.

CLOTHES PIN.—C. G. MILHART, Sumner, Wash. This invention relates to clothes pins of the clamp type and adapted to be mounted permanently on clotheslines, the object is to provide a simple and inexpensive clamp which can be operated easily with one hand. The device comprises two wire members each presenting a jaw, which are adapted to interlock, and arms separated from the jaws by eyelets, the eyelets being adapted to engage a clothesline.

FRUIT WASHER.—F. C. RANDALL, 518 Broadway, Benton Harbor, Mich. Two patents have been granted to Mr. Randall, they relate to washing fruit and vegetables, and both are improvements over the form of Patent No. 1,161,727 issued November 1915 to the same inventor. The first of the present form the larger device of two, avoids all abrupt angles tending to check the flow of water, it may be made of one piece of metal, provides a dome having integral fins tending to center the dome within a faucet or hose, it affords a rapid exit for sand or dirt, and the formation permits of the nesting of a relatively large quantity of fruit or vegetables in a given space. The second invention is to simplify and cheapen the construction of the device as a household commodity, it is adapted particularly for use in direct connection with an ordinary sink faucet, while at the same time it is adapted for use in connection with any ordinary hose or faucet connection, the contents may be more thoroughly cleaned in a brief time and with less injury to the same, than is usually possible.

AUXILIARY SEAT FOR BABY CARRIAGE.—J. CARROLL, 65 3d Place, Brooklyn,

N. Y. The invention relates to an auxiliary seat for holding an older child while the carriage is used for holding a baby, the seat is disposed within the handle of the baby carriage and behind the body thereof, so that it takes up comparatively little room and is so positioned as to insure stability of the carriage, the device is detachably engaged with the axle and handle bars of the carriage.

SPRING GRIP BOOK OR SESSION MARKER.—H. P. LOVELAND, 1610 W. Broadway, Sedalia, Missouri. The invention relates to a book marker constructed of thin resilient metal, and comprising flat jaws one overlying the other, and one of them being provided with a transverse ridge on the inner side, which serves as a fulcrum for the opposite jaw, the two jaws having a narrow connecting portion whose sides are bowed outwardly and tend to hold the free ends of the jaws normally in contact.

COMPOSITION FOR RENDERING OIL PAINT TRANSPARENT.—B. S. REED, 1100 Weller Ave., Springfield, Missouri. This invention relates particularly to a composition for use in connection with oil paints, so as to render the paint transparent. The object is to provide a composition of matter which will have no chemical effect on the colors themselves and which therefore insures the permanency of the colors that would not be obtained by the use of other means which would tend at all to react chemically with the colors.

COPY-HOLDING DEVICE.—W. E. GRAY, care of Barts Blood and Bancroft, 728-35 A. C. Foster Bldg., Denver, Colo. The present invention relates to an attachment for typewriters described in patent No. 1,209,429, granted to the above named patentee. The object is to provide certain connections whereby the pivot point of the indicating bar may be adjusted toward and away from the copy holder plate, thus providing for the reception of more or less bulky copy, between the indicating bar and the copy holder plate.

FILM PACKED CAMERA.—H. P. MOXON, care of Ansco Co., Binghamton, N. Y. The object of this invention is to provide an inexpensive film packed camera arranged to allow of conveniently moving single sensitized films successively into the field of exposure, in order to accomplish the desired result use is made of a sealed camera casing provided with lens and shutter and a roll film within the casing, and adapted to be unwound and drawn across the field of exposure, the exposed films being adapted to be separated and singly stored in flat shape within the casing. The camera is permanently closed and loaded during the process of manufacture, the film can only be removed by the partial destruction of the camera.

ASH TRAY.—A. LIENHART, 921 8th Ave., New York, N. Y. The invention has for its object the provision of an ash tray which may be readily applied to or removed from any given support, the tray has a removable bowl, and a swinging arm arranged to engage a support which may be positioned in different planes according to the piece of furniture to which it is connected.

NAUTICAL INSTRUMENT.—G. KOFFSKY, care of Dr. F. J. Hartley, 730 Clovet St., New Orleans, La. This invention relates to an instrument for solving mechanically the astronomical triangle, it is particularly adaptable for navigation purposes. Another object is to provide an instrument by which the sun gives the position of the instrument at any hour of the day, consequently the position of a vessel at sea may be determined, the determination of the exact location depending on the accuracy of the elements constituting the device.

Hardware and Tools

SCREW FEED.—S. A. SWANSON, P. O. Box 141, Oakville, Conn. The invention relates to screw feeds for pin stickers. An object is to provide a simple and efficient screw feed in which the screw is so arranged as to reduce the wear thereof to a minimum. A further object is to provide a screw feed in which the pins engage the screw at one side and proximate the end thereof, reducing wear of the thread at the end and skipping, which is generally due to wear of the end of the thread.

ASH CAN.—H. MECKING, 1044 Hall Place, Bronx, N. Y. This invention relates to ash cans provided with a cover. The object is to provide a simple strong and sanitary ash can which has a sectional cover adapted to prevent discharge of the contents unless the can is subjected to a shock whereby the contents throw the cover open and are free to discharge.

FAUCET.—G. K. HOFF, 1314 Spruce St., Philadelphia, Pa. The object of this invention is to provide a faucet arranged to prevent leakage, to restrict the compression of the compressible ball valve, to insure uniform wear of the same, to reduce the wear of the seat to a minimum, and to allow of readily replacing the compressible ball valve whenever it becomes worn out.

DOOR SPRING.—O. KATZENBERGER, care of Lawson Mfg. Co., 228 W. Superior St., Chicago, Ill. The object of the invention is to provide a construction whereby a spring may be wound but cannot be wound to an undesirable extent. A further object is the provision of a winding member for a spring and a stop or lug projecting therefrom for limiting the rotary movement.

DOOR CHECK OR CLOSER.—P. QUENTIN, Paris, France. This invention relates to door checks which are employed for closing a door by the action of a spring. The object is to provide a door closer the construction of which secures an efficient and durable operation for the purpose of moderating the closing motion of the door.

CUTTING-OFF TOOL.—F. HARTMANN, 827 Willow Ave., Hoboken, N. J. The invention relates to cutting-off tools particularly adapted for use on lathes. An object is to provide a tool which will eliminate the danger of gripping during the process of cutting, the cutting members being detachable from the feeding means so that they can be easily replaced without much labor.

MICROMETRIC CALIPERS.—B. NEFEDOV, General Delivery, Ansonia, Conn. Among the principal objects of the invention are to provide means for disclosing with accuracy the disposition of a metal cutting tool, for predetermining the proper set of the tool, to clearly indicate the disadjustment of a tool of the character mentioned, and to avoid errors in setting tools arising from resiliency of the tool parts or indurment of the metal being operated upon.

SHEAVE BLOCK.—B. B. BOSWORTH, 471 W. 145th St., New York, N. Y. The invention relates to small sheave blocks such as are used in pulleys for awnings elevating racks, boat tackles, etc. The object is to provide a block combining the lightness, strength and durability of pressed or bent metal construction with certain mechanical improvements, which enable this sheave block to successfully meet a number of operating conditions.

BROACHING TOOL.—F. O. FURBER, Saco, Maine. This invention relates to woodworking tools and has particular reference to broaching or forming of square or other polygonal holes in long pieces of timber. Among the special objects is to provide means whereby the cutting portion of the tool may readily be separated from the other parts and sharpened when necessary.

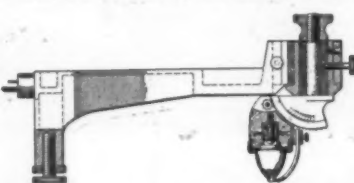
DRILL AND TAP INDICATOR.—J. I. D. BUSTOL, Villa Perry, Perry Heights, Chappaqua, N. Y. The invention is particularly for use on a metal workers bench. Among the objects are to provide a simple and convenient holder for correlated groups or series of screws, drills and taps, by which the proper tap drill and body drill and proper tap for use in connection with any selected screw can be immediately selected without possibility of mistake or loss of time.

Machines and Mechanical Devices

TRANSMISSION MECHANISM FOR POWER-DRIVEN VEHICLES.—F. W. KEMPER, 205 W. 107th St., New York, N. Y. Among the principal objects which the invention has in view are: To vary the rate of rotation transmitted from a driving shaft to a driven shaft, to provide means for controlling the transmission, to avoid shock to the mechanism, and to release the driving shaft from all load during the idling of the engine with which it is connected.

AUTOMATIC UNCOUPLING MEANS FOR SHAFT CLUTCHES.—G. H. RICE, Castner, Territory of Hawaii. This inventor has obtained two patents, Nos. 1,242,723 and 1,242,724, covering different means for use on an automobile or truck whereby to prevent injury to the operator by the crank handle should the engine back-fire, the means employed consisting of stop elements operable to arrest the reverse turning movement of the shaft and cause a sliding movement to be imparted to the crank shaft to unclutch the same from the engine shaft.

APPARATUS FOR GRINDING OR POLISHING PRECIOUS STONES.—H. DE VRIES and W. A. DONALDSON, 123 Liberty St., New York, N. Y. The object of the invention is to provide an apparatus for grinding and polishing diamonds and other precious stones, it is arranged to enable the workman to correctly set the dop so as to



A SECTIONAL SIDE ELEVATION OF THE DEVICE

grind or polish the facets, both as to number and desired angle. In order to produce this result use is made of a dop-holding device, and means for adjusting the device in an arc with the center of the stone held by the dop-holding device located outside of the arc.

APPARATUS FOR TREATING ORES.—A. J. GARVER, care of International Copper Co., Leland, Oregon. An object of this invention is to provide, a simple convenient, and inexpensive plant for carrying out the roasting of ores, whereby the general efficiency for handling ores is greatly increased. A further object is to utilize the fumes arising from the roasted ores by directing the fumes into the ore tank and there converting them into acid, which reacts with the ores, thus dispensing with the use of independent acid chambers.

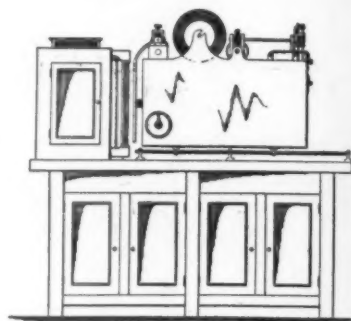
TRANSMISSION CHAIN OR BELT.—J. LYNN, Aliso, Texas. The present invention relates more particularly to the chain forming the subject matter of Patent No. 1,185,336 granted to the same inventor May 30, 1916. The present form is designed for embodiment in a chain or link belt, for use on flat-face pulleys whereas the construction in the patent above referred to is adapted for flanged or grooved pulleys. The invention is especially useful as a substitute for leather drive belts on automobiles and other machines where belts are subject to heat, water, oil or dirt which make it difficult to maintain the belt tight on the pulley.

CIRCULAR MULTIPLE MACHINE-TABLE.—R. S. ABRAHAM, Kingsport, Tenn. The invention relates to machine shop apparatus and

has particular reference to work-holding means in the form of a movable table or circular series of associated individual work-supporting tables movable step by step successively before any suitable number of machines operated also in series along the series of tables, the table units, continue always in the same path or line of action.

DUPLICATING MACHINE.—A. F. WEGENER, Linwood Ave., Ridgewood, N. J. This invention relates to a copying or duplicating machine, adapted particularly for reproducing any suitable number of copies of sheets of typewritten manuscript, drawings or the like. Another object is to provide a machine with means for gripping or holding one end of the sheet so as to increase both speed of operation and accuracy of alignment.

PHOTOPRINTING MACHINE.—W. H. FRIBLEY, care of J. S. Fribley, Aberdeen, Wash. The invention relates to the automatic printing of photographic positives in desired quantity, one of the main objects is to provide a machine which is adaptable to various sizes of negatives, which is adjustable to a desired field in any negative, and in which time exposures may be suited to the



A SIDE ELEVATION OF THE MACHINE

particular negative through which the prints are made. Another object is to provide a lamp box and a frame for the sensitized paper control entirely independent of each other though adapted to be moved into operative relationship at will, either longitudinally or transversely of the machine, and an electric prime mover which is actuated from an ordinary lamp socket.

GATE-VALVE.—C. E. OSWALD, address D. E. Keppelmann, 267 14th Ave., San Francisco, Calif. This invention has for its object to provide a valve which will be tight at all times, irrespective of wear and length of service, and irrespective of presence of foreign matter wherein the valve is wedge-shaped and moves between wedge-shaped seats, and wherein the seat is not exposed to liquids or gasses carried in the pipe line through the valve.

CAR TIPPLE.—J. DIXON, P. O. Box, 144 Whitwell, Tenn. The object of this invention is to provide mechanism for dumping loaded cars, wherein a rotatable cylinder is provided, carrying holders for loaded and empty cars, and so arranged that half rotation of the cylinder will turn the cars completely over to dump the load, and wherein the loaded cars are run down into the tipple and the empty cars are run down out of the tipple, giving a downward inclination in both directions. A further object is to provide automatically operated mechanism for locking and releasing the cars, and wherein the delivery means is reversible.

PIPE-ROLLING MACHINE.—C. M. VAIDEN, 539 E. 14th N. Portland, Ore. This invention has for its object the provision of a machine for rolling corrugated pipe sections, wherein the sheet metal for forming the pipe is rolled in shape between upper and lower roll, there are means for separating the rolls to release the pipe from the corrugations of the rolls, and means for moving the pipe from off the rolls to permit the insertion of another sheet of metal.

TRACTOR.—E. B. FUQUA, R. F. D. No. 6, Memphis, Tenn. The invention relates generally to tractors but more particularly to a tractor embodying a single wheel within which the driving mechanism and the majority, at least, of the mechanical parts and connections are housed, an object is to provide a tractor for light work, for which a cumbersome structure could not be used, as well as one which will occupy but minimum space in operation, and disuse.

STREET-CLEANING MACHINE.—V. CACERES, care of Canning and Co., Port of Spain, Trinidad. Among the principal objects of the invention are to provide a machine for removing snow or other deposit from the streets, to break hardened formation preparatory to removing it, to provide a special mechanism for elevating and loading series of independent vehicles, and to simplify the mechanism required for the performance of the above stated objects.

GEARING FOR HOISTING APPARATUS.—H. HANSEN and J. O. SMITH, address Henry Hansen, Woodbine, Iowa. The invention is intended more particularly for embodiment in a machine involving the use of a crane and bucket and adapted to be employed for various purposes, such as digging, loading manure, hoisting, or as a hay stacker. The machine includes a mast mounted to turn, a drive shaft, a counter shaft geared with the drive shaft, worms on the drive shaft and counter shaft a worm wheel movable vertically on the mast to engage with either of the said worms or to a neutral position and adapted to turn the mast about its vertical axis, and means to raise and lower the worm wheel.

(Concluded on page 116)

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Vitrolac Varnish	Leather Solutions
Flowkote Enamel	Soluble Cotton
Antioxide Iron Paint	Metal Lacquers
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DU PONT

RECENTLY PATENTED INVENTIONS

(Concluded from page 114)

SAWMILL FEED.—G. S. SERGEANT, care of Sergeant Manufacturing Co., Greensboro, N. C. The invention relates particularly to a portable mechanism which may be disposed within the hunk frame of a sawmill feed to bring about relatively slow feeding movement of the sawmill carriage and relatively fast retractile movement, the mechanism being equally applicable to rack feed and rope feed apparatus.

PUMP PLUNGER.—H. M. CLOUDE, McMillan and Boone Sts., Cincinnati, Ohio. An object of the invention is to provide a plunger for use with pumps either of the pneumatic or the hydraulic type which will hug the interior of the cylinder closely when making a compression stroke, but will retract readily from the walls of the cylinder when moving in the opposite direction, the parts of the plunger may be readily assembled or replaced.

PEN CLAMP FOR RULING MACHINES.—A. BROADMEYER, address the W. O. Hickok Mfg. Co., P. O. Box 446, Harrisburg, Pa. The object of the invention is to provide a pen clamp by means of which pens may be clamped and released from the upper side of the clamp in the machine, and by which their connections may be readily made and rigidly maintained at all times without danger of displacement.

KEEPER FOR MINE-CARS.—A. W. SPART, and G. R. JACOBS, Christopher, Ill. The invention particularly relates to keepers arranged to automatically stop and "spot" the cars on a hoisting cage, and to hold the same while being hoisted and dumped and while being lowered to the bottom of the mine shaft, provision being made to automatically open the keepers when the car arrives at the bottom of the shaft to allow the empty car to leave the cage and a loaded car to take its place.

WIND-WHEEL.—C. E. RUBOTTOM, 118 Ave. 18, S. Los Angeles, Cal. This invention relates particularly to a wind wheel having a series of rotating wings, the structure, action and control of which are in accordance with the invention intended to materially increase the efficiency of the wheel, the primary object being to provide an arrangement producing greatly increased wind resistance in one direction, and correspondingly decreased wind resistance in the other direction.

STOP MECHANISM.—D. W. WOOD, care of Wood Turret Machine Co., Brazil, Ind. The invention relates to lathes, drillpresses, milling machines and similar machines using a turret head and stop rods. The object is to provide stop mechanism for machines and arranged to insure automatically a positive stopping of the turret slide and its turret head according to the predetermined feed intended to be given the turret head. Another object is to positively unlock the turret head immediately prior to turning it in unison with the revoluble head carrying the stop rods.

EXPANDING BRAKE BAND GUIDE.—S. A. TELL, Bangor, Pa. The invention deals particularly with that type of brake in which the free ends of the band are spread apart by an interposed rotary cam. The general object is to improve brakes of this character so as to be more reliable, durable, and substantial and capable of producing a more uniform gripping action on the brake drum. A more specific object is the provision of a guide for preventing the cam in rotation from throwing one end of the brake band inwardly whereby the cam will produce a uniform outward action on both ends of the brake band.

COMBINED TUBE MILL AND BALL MILL.—L. L. MURPHY, Manhattan, Nev. The invention relates to a grinding mill of the general form of the tube mill but divided transversely into compartments, the first of which contains heavy balls by which the rock is broken up, the material being fed to the second compartment containing pebbles, for grinding the broken material. The particular object is to provide means for separating the compartments and for feeding the material from the first to the second compartment to be ground.

PITMAN FOR DRILLING MACHINES.—W. C. SOLE, Sullivan, Ind. This invention relates to deep well drilling machines and has particular reference to the pitman connection between the power shaft crank and the walking beam. Among the objects is to provide a pitman having a construction which may be termed



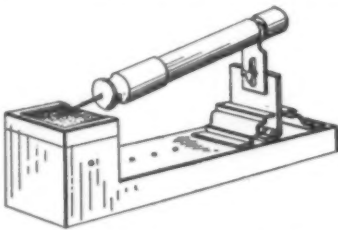
SIDE ELEVATION SHOWN AS APPLIED TO WALKING BEAM AND POWER CRANK

telescopic and which includes a spring having length and compressibility enough to allow the crank to make a complete rotation in case the tools stick in the hole, thereby preventing breakage of the connections or the power shaft. The spring also has sufficient rigidity to provide for the normal operation of the walking beam.

COAL LOADER.—D. B. STUART, Uniontown, Pa. This invention relates to coal handling devices and has particular reference to mechanism for gathering and conveying coal from the ground and delivering it into mine cars. Another object is to provide a machine of a substantially self-contained nature which carries its own power devices, being designed for operation where the amount of head and side room is limited.

Musical Devices

NEEDLE SHARPENER.—F. W. BOCKING, Van Buren, Ark. The invention relates to a device for sharpening the needles of talking machines, more particularly the composition needles now largely employed. The prime object



A PERSPECTIVE VIEW OF THE DEVICE

is to provide a sharpening device whereby the needles may be given a desired taper, and the sharpening accomplished with accuracy and dispatch. The invention provides a durable device made up of simple elements, and may be cheaply produced.

SOUND BOX.—H. L. BERGER and F. C. KNOCH, 1863 Second Ave., New York, N. Y. This invention relates to sound boxes for talking machines, its object is to provide a construction whereby the vibration of the sound box will not be transmitted to the stylus. Another object is to provide a separate support for a stylus formed independent of the parts forming the sound box proper. In order that none of the vibration of the stylus caused by the grooves in a record shall be transmitted to the diaphragm.

Prime Movers and Their Accessories

PACKING FOR SHAFT BEARINGS.—F. J. URION, Fairmont, Minn. The invention relates to packing for bearings and is particularly adapted for crank pits of internal-combustion engines where crank-pit compression is necessary, and is characterized by the combination of a bearing housing presenting a bore, packing rings adapted to fit into the bore, and having tapering surface, shaft bearing means adapted to fit tightly into the bore to contact with the packing rings, and means for securing the rings.

ROTARY ENGINE.—F. G. O'ROURKE, care of Graves Hotel, 953 Ridge Road, Lackawanna, N. Y. The object of this invention is to provide an engine, wherein a stator is provided and a rotor moving in the stator, together with an abutment which is moved into and out of the path of movement of the rotor, the stator having an inlet on one side of the abutment and an exhaust on the other side. The engine is very strong for its size, simple in construction and cheaply manufactured. The noise from the exhaust is reduced to a minimum.

ROTARY ENGINE.—G. W. MACKINNON, 96 St. Botolph St., Boston, Mass. Among the objects of the invention is to provide an engine of the rotary piston type adapted to be operated by the force of a power fluid such as steam, provision being made for a novel type of abutment cooperating automatically with the extension or crest portion of the piston so as to insure that there would be no material back pressure tending to retard the movement of the piston, and also insuring that there shall be no leakage between the piston and the other parts.

ROTARY VALVE FOR GAS ENGINES.—H. P. STEVENS, 631 W. 207th St., New York, N. Y. The general object of this invention is to simplify the construction and operation of the inlet and exhaust valves so as to insure noiseless running and avoidance of valve troubles in the common forms of valves. A more specific object is the provision of a pair of rotary valve disks arranged at opposite sides of the head of a cylinder and connected with a single shaft so as to open and close the inlet and exhaust ports in the proper sequence for the cycle of operation.

Railways and Their Accessories

TRACK OILER.—L. G. ATHERTON, 574 Grand Ave., Astoria, L. I., N. Y. The objects of the invention are to provide an attachment that may be applied to oil can spouts of the usual form, whereby an ample flow of crude oil will be insured under different conditions of atmospheric temperatures, to provide guide means on the spout of the can, so formed as to have guided engagement with the track rail, whereby to cause the oil to be directed along the line of contact of a car wheel flange at the inside of the rail.

MAGNETIC BRAKE.—C. KOCH, 2398 Cal-alpa Ave., Brooklyn, N. Y. This invention has particular reference to magnetic brakes employed in connection with railway car wheels, although not limited to any particular type of machine. Among the objects is to provide a magnetic brake comprising a core or magnetic field, a metallic plate, associated with the core, and adapted to become energized coincidentally with the energizing of the field, and an auxiliary plate arranged parallel to the first mentioned plate and movable adjustably toward or from the same.

MAIL DELIVERY APPARATUS.—G. W. FARTHING, Lawrenceville, Va. One of the principal objects of the invention is to provide a mail delivery apparatus for exchange of bags

of mail between moving train and station, the apparatus being so constructed as to make the exchange with the least danger of damage to the mail pouches or their contents.

Pertaining to Vehicles

VEHICLE TIRE.—J. MONSON, 201 E. 30th St., New York, N. Y. The object of this invention is to provide a vehicle tire of the non-inflatable type and arranged to offer a gradually increasing resistance to stresses exerted upon it. In order to accomplish this result, use is made of a plurality of individual tire bodies with tread in common.

HEAT CONTROLLER FOR AUTOMOBILE RADIATORS.—R. CARLSON, 1040 Lexington Ave., New York, N. Y. The object of the invention is to provide a heat controller arranged to enable the driver of the automobile to control the heat in the hood and to insure proper running of the engine in all kinds of weather. In order to accomplish this result a curtain is provided attached to the front of the radiator, and a roller on which the curtain winds, the operating means connected with the roller extending to the dashboard of the automobile within convenient reach of the driver.

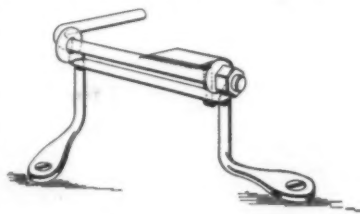
HOLDER FOR NUMBER PLATES.—O. A. WARE, East Paxinos Ave., Eastern, Pa. The objects of this invention are to provide a holder adapted to accommodate one number plate or an extra number plate, and equipped with retaining springs so formed as to tightly clamp the plate between the springs and the holder, and in addition to engage the plate at the upper edges, thereby effectually preventing accidental displacement, the device is so formed that the plates may be easily secured or removed.

ATTACHMENT FOR STEERING WHEELS.—M. K. LEWIS, Lompoc, Cal. This invention relates to tractor attachments, and has for its object to provide mechanism for use in connection with tractors of any character, for permitting the vehicle to be controlled from a point outside the same, as, for instance, by a driver in another vehicle running alongside, or behind, or in front.

PUSH BUTTON FOR STEERING POSTS.—M. S. YOUNG, 712 Harriet St., Flint, Mich. This invention relates to signaling or alarm devices adapted especially for automobiles. Among the objects is to provide a push button attachment for the upper end or head of a steering post, where it will be within easy and convenient reach of the operator having command of the steering wheel or other mechanism.

SPOKE MITERING MACHINE.—G. A. ENSIGN and J. C. M. DES ISLETS, Defiance, Ohio. This invention relates to woodworking machines. Its object is to provide a machine designed to simultaneously miter or bevel both sides of the hub end of a spoke. Another object is to allow of running the machine a high speed to insure accurate mitering of a large number of spokes in a comparatively short time and without danger of injuring the attendant of the machine.

SAFETY LATCH.—A. A. STILL, Anette, Calif. This latch mechanism is for preventing the movement of control levers of motor cars into the reverse, it comprises a bracket for attachment to the car, the bracket consisting of a body portion formed from a rod bent to form a horizontal body means for connecting the bracket



PERSPECTIVE VIEW OF LATCH IN LOCKING POSITION

to the car, a latch bar bent at one end to form a handle and having near the end remote from the handle a laterally extended stop, with provision for engaging the body of the bracket to hold the stop in horizontal position. The latch also prevents burring the reverse gear when coming out of low.

PLANETARY TRANSMISSION.—S. V. DICKMAN, care of S. S. Leviathan, care of Postmaster, New York, N. Y. The object of the invention is to provide a simple contrivance which is particularly adaptable for use in conjunction with the Ford transmission. When this device is interposed between the differential and the transmission of a car, it will permit a further reduction in speed in both directions. The rotary motion of the gears splashes the oil within the casing into the cups or recesses formed on the various parts and connected by channels with the bearing surfaces of the moving parts therein assuring perfect lubrication.

DIRECTION INDICATOR FOR AUTOMOBILES.—J. A. TRIMBLE and I. R. CONCOFF, address Joseph A. Trimble, 295 12th St., Portland, Or. The object of the invention is to provide means whereby the driver may give a signal when he desires to steer to the right or left, or slow down or stop, the signal means is in the form of a semaphore, mounted at either side of the wind shield, and for adapting the semaphore for day and night service, it is provided with a disk which can be seen by day, and with which is associated a lamp that can be lighted for use at night.

AUDIBLE ALARM FOR VEHICLES.—H. MORGAN, address L. H. Morgan, Henryville, Ind. Among the objects of the invention is to provide an audible alarm adapted particularly for use in connection with automobiles or other road

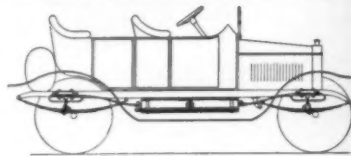
vehicles, including a casing within which the device, such as a gong, is located, and a shiftable actuator adapted in one position to cause the gong to sound, the actuator being so secured to the rotating shaft journaled in the casing as to be effective when the machine is in operation and the owner is absent.

BAGGAGE TRUCK.—L. B. FERGUSON, Monroe, La. The invention relates generally to baggage trucks utilized upon station platforms and at similar points, the primary object of the invention is to provide in connection with the usual truck, certain attachments in the interest of safety, including means for effecting vertical movement of the truck handle to an elevated position sufficient to eliminate all danger of tripping over the handle, and the provision of a brake member engageable with one of the wheels, automatically checking the movement of the truck when the handle is released.

AUXILIARY TREAD FOR TIRES.—E. BARDELL, 85 Corson Place, Stapleton, S. I., N. Y. Among the objects of the invention is to provide a special form of tire or shoe adapted to have removably secured thereto an auxiliary annular member or wearing portion. Another object is to provide means for applying a new tread member to the same shoe after the previous one has worn out or become disabled.

SHOCK ABSORBER.—J. H. HUGHES and G. J. WIDEMAN, address Geo. J. Wiedeman, Lewistown, Mont. This invention relates to shock absorbers for vehicles and has reference more particularly to a modified suspension of the rear end of the vehicle frame. The object is to provide a simple, strong and efficient combination of springs which will eliminate shocks and render riding easy and smooth.

MECHANISM FOR OPERATING AIR-COMPRESSORS, ETC.—I. E. BROWN, Toyahvale, Texas. The invention relates to mechanism for operating air compressors operable by the vertical movement of a vehicle body with respect to the axles, and which also acts as a shock ab-



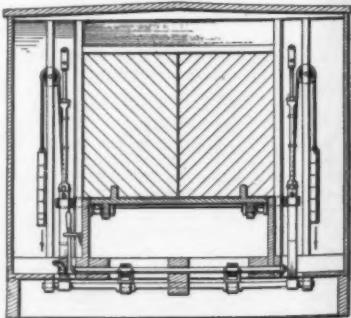
SIDE ELEVATION OF AN AUTOMOBILE WITH THE INVENTION

sorber for the body, the main object is to provide such a device which is readily applied to an existing automobile without change in the latter. The device stores compressed air ready for use for tire inflation, for air starters, for air-brakes, and for cleaning the dust from the automobiles, etc.

AUTOMOBILE SIGNAL.—J. H. MACLEAM, 305 E. Ann St., Ann Arbor, Mich. The object of the invention is to provide a device wherein a series of signaling arms is provided normally in-cased and spring held in inoperative position, and having means for swinging any predetermined signal into operative position, means for releasably holding signal in such position, capable of being manually or automatically released, and wherein lighting means is provided controlled by the swinging of the signal into operative position.

TIRE-REMOVER.—A. LEW, Baker, Ore. The invention has for its object to provide mechanism for use with demountable rims for contracting the rim after removal from the wheel to permit the placing of the tire. The device comprising mechanism for contracting and expanding a split rim, means for securing the rim upon one side of the split, a clamp engaging the rim upon the opposite side, means for moving the clamp inward to disengage the ends, and means for moving the clamp toward the rim securing means to contract the rim.

AUTOMATIC GARAGE DOOR.—J. J. SABIN, Coupeville, Wash. The object of this invention is to provide doors or gates for carriage-ways, particularly for garages or analogous structures, which are operated automatically by the weight of a vehicle as it approaches the doors. The device



SHOWING A SECTIONAL ELEVATION

comprises a combination of a swinging door, and vertical pivoted posts having spiral slots, a transverse counter weighted bar projecting through the slots, lever inclines pivoted on opposite sides of the bar and their inner ends supported by the latter, means for locking the bar in raised position, and means for tripping the locking devices to permit the doors to swing open.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patented title of the invention, and date of this paper.

Casting Pipe Centrifugally

(Concluded from page 99)

sizes of the centrifugal pipe by the waterworks of Rio Janeiro and Sao Paulo. In every case the maximum pressure which the Department's pumps were able to put upon the pipes—from forty to fifty atmospheres, for the most part—was supported without any indication of breakage, leakage or sweating. In addition, important endorsements were given the pipe on the ground of non-corrosiveness. No explanation is offered for this other than that the very compact consistency is believed to have something to do with it.

The Brazilian machine, however, is not the Ultima Thule of the centrifugal pipe. The waterworks tests have revealed that in many of the pieces there exists a chilled layer which should not be there; and this is attributed to undue slowness in extracting the pipe from the mold, as well as to the impossibility of securing in Brazil, under wartime conditions, iron of the most advantageous chemical composition. Another great difficulty was found to inhere in the presence of the ribs for the water circulation; owing to the extraordinary vibration accompanying the rotation of the mold, its life was not what it should be; the structural weakness involved by the presence of the ribs caused it to crack and break while still too young for anything of that sort to be tolerated.

It was decided that a more favorable place in which to fight these troubles could be found; and accordingly Mr. de Lavaud and his experiments have moved to North America, and operations have begun in Toronto. It is confidently anticipated that all the drawbacks mentioned, as well as any others which may crop out, will be finally overcome as the result of the work now being done in that city. So great is this confidence, in fact, that a large plant is being built upon American soil for the manufacture of centrifugal pipe and the further development of the technique involved.

That the goal aimed at is one worth seeking long and earnestly is amply indicated by the catalog of the advantages claimed for centrifugal pipe over the ordinary kinds. These embrace not only a great reduction in the cost of installation and in the direct cost of manufacture, but mechanical superiority in many directions. It is stated that the centrifugal pipe possesses a tensile strength 30 per cent greater than any other kind, with a reduction in weight of 40 per cent; that it is far less susceptible to corrosion; that it is sufficiently soft to be worked with any good tools; that there is practically no variation in the thickness around the cross section of the pipe; that there is obtained a complete elimination of air bulls in the walls; and that the centrifugal pipe may be made in lengths never before dreamed of as possible.

The Twentieth Century Trolley Hospital

(Concluded from page 106)

the control of a set of levers in the pit, will lower it to the level of the pit floor. When it gets down to that level it becomes part of a track which runs the entire length of the pit floor. So a wheel replacement requires only that the car be run out on the track until the offending member rests on the elevator section. It is then the work of a moment for the man in the pit to free the axle from the rest of the truck, and to lower it, with its wheels, to the pit floor. Once down, it is rolled away along the pit track, the supporting posts at the sides of the pit being cut away just enough to permit this. It is then a quick job to bring a new axle unit to rest on the elevator section of the track, and to hoist it back in place.

Perhaps it has never occurred to the average trolley rider to ask what becomes of all the flat wheels that are thus made away with. The answer is simple—they go to the turner and are made round again. Now this sounds like a delicate contract; for it is plain enough that no two wheels will wear just the same, and it is equally plain that if the two wheels installed on the same axle are not the same size, trouble

73d ANNUAL REPORT NEW YORK LIFE INSURANCE COMPANY

346 & 348 BROADWAY - - NEW YORK CITY

(Organized under the laws of the State of New York)

TO THE POLICY-HOLDERS AND THE PUBLIC:

Admitted Assets, Dec. 31, 1917 . . . \$934,929,381.52

These assets are the property of over 1,000,000 people with their dependents (in accordance with their contractual rights). The company is purely mutual; it has no capital stock.

Legal Liabilities \$760,742,335.52

Reserved for dividends payable in 1918 \$26,561,063.64

Reserved for dividends on deferred dividend policies maturing subsequent to 1918 107,041,778.00

Reserved for Contingencies 40,584,204.86 **\$174,187,046.00**

Total \$934,929,381.52

For the year 1917 the Company's mortality rate was the lowest in its history

Average earning power of total Ledger Assets—

December 31, 1917, 4.59%.

December 31, 1916, 4.54%.

New paid business for the year \$316,000,000

Outstanding Insurance, end of 1917 \$2,678,000,000

Paid policy-holders during year \$87,000,000

The annual dividend rate of 1917 will be maintained in 1918.

Liberty Loan Bonds owned Dec. 31, 1917 \$12,075,000

SUPPORT THE GOVERNMENT

We urge all policy-holders to buy War Savings and Thrift Stamps.

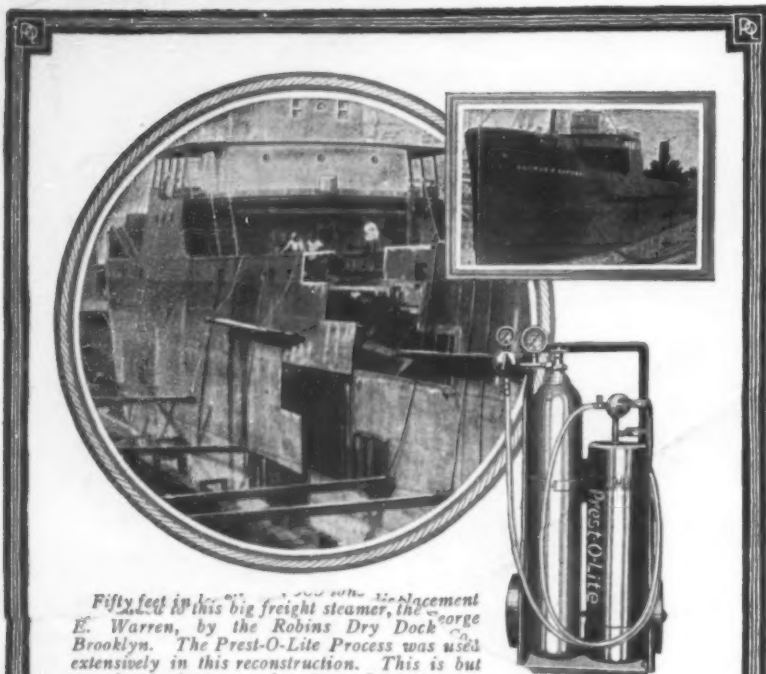
We have directed all agents to take no application for insurance from a soldier or sailor unless the applicant already has the limit with the Government.

BACK UP THE GOVERNMENT

A detailed statement will be sent to any person asking for it.

January 14, 1918.

DARWIN P. KINGSLEY, *President.*



Fifty feet in the big freight steamer, the George E. Warren, by the Robins Dry Dock Brooklyn. The Prest-O-Lite Process was used extensively in this reconstruction. This is but one of many instances where Prest-O-Lite is being used successfully in shipbuilding and repairs.

Solving Ship Problems by Prest-O-Lite Process

War has called for the greatest efficiency in ship construction and reconstruction. And one of the results has been the extensive employment of the oxy-acetylene process.

Not only in construction work of all kinds, but in the conservation of millions of dollars of scrap-pile waste, this process is helping American manufacturers to meet the unusual requirements of war business.

Practically every leading industry of the country offers examples of its stronger, neater products, simplified production, lower cost and lessened waste.

Oxy-acetylene welding and cutting will probably solve for you some problem of design, cost, or convenience, or result in some big material saving in your plant. Investigate

Prest-O-Lite

PROCESS

Offers a simple, inexpensive, portable outfit for all classes of work—employs both gases (acetylene and oxygen) in portable cylinders. Acetylene supply is backed by Prest-O-Lite Service, which insures prompt exchange of empty cylinders for full ones. Provides dry, purified gas, insuring better welds, quicker work and lower cost. Avoids large initial outlay and depreciation. Any average workman can learn the process quickly and easily.

Millions of dollars' worth of valuable castings, machine parts and tools are being reclaimed from the scrap-heap by this process. Railroads, foundries, mines, machine shops and garages are realizing big returns on repair work alone. One quick repair may save the entire cost of a Prest-O-Lite outfit by avoiding a tie-up through the breakdown of an important machine. Wherever two pieces of metal are to be joined—consider welding.

Write for valuable welding data describing and illustrating Prest-O-Lite Process in hundreds of profitable uses for construction, manufacture and repair.

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will follow and lots of it. But when we are told that a special lathe is provided, with two working points, separated by an axle length, the problem is resolved into a simple one. The whole axle unit—the axle with the two wheels attached—goes to the lathe, and the two wheels are machined simultaneously and uniformly until the worst worn one is round again. Then we have a perfect axle unit once more, ready for service. There is no standard size to which all wheels are re-turned; for it makes no difference if there is a discrepancy between two trucks or between two pairs of wheels on the same truck, provided the two wheels on the same axle are always the same size. Incidentally, it is now clear why, in the preceding paragraph, we replaced a whole axle unit, instead of a single wheel. Whatever we do to one wheel, we must likewise do to its partner.

Quick location of difficulties and quick remedy are the watchwords in this repair shop. Thus, when a car is giving false operation and the trouble cannot be located by the usual inspection methods it is sent to the motor shop and tested out by means of an ammeter testing box connected to contacts on the controller. The operator knows the resistance which the various circuits must show, and by checking out these values is enabled to detect the faulty spot. This test will locate broken grids, loose connections, short circuits in motor winding, open circuits, and grounds in motor and car wiring. The equipment consists essentially of a set of ratio resistance coils, a set of standard resistance coils arranged in convenient steps, a battery of small cells to supply the testing current, a sensitive galvanometer calibrated to read resistance direct, and keys or switches to control the circuits. These parts are all mounted in a wooden carrying case and permanently connected to make up a modification of the well-known Wheatstone bridge set, commonly used to measure resistances.

And so it goes. One might well rest content with thus stating the general principles followed in the trolley repair practice of the day, despairing of covering all the clever little tricks to be observed and all the ingenious mechanical contrivances to be found in a big shop like the one of which we write. But it would hardly be fair to stop without some reference to the latter. Some of them do things which must obviously be done—as, for instance, the mechanical seat scrubber. The rattan seats and backs are removed from the car and placed upon this machine, against revolving brushes which, with the aid of a liberal supply of water, achieve cleanliness with a maximum of speed and a minimum of effort on the part of the operator. Then there are other things which must be done, but which are so far from obvious that the layman has probably never even thought of them.

Everybody, for instance, has at some stage in his career straightened a bent nail or a crooked pin; but who has ever drawn the parallel between this operation and that of straightening a trolley car? Yet a moment's reflection will make it plain that trolley cars must be straightened. Especially with the extensive use of steel cars has come the problem of maintaining proper shape and alignment, since, in addition to the usual exposure to collision from other cars and from vehicle traffic, these introduce structural and temperature stresses calculated to produce a bending wholly foreign to the nailed-together box of former days. At the Cleveland shops is found a very clever device known as a car straightener, as illustrated. A steel car that has been thrown out of alignment is placed in this huge vise and by means of jacks located at desired points is brought back into alignment. When not in use the large jaws swing back into the floor out of the way.

Among the small economies which count so big there is one practiced by this shop which must be mentioned here. It would seem that about the most useless thing in the world is a chip of broken window glass. Not so, however; these fragments are here made over into imitation chipped glass

for deck lights. The surface of the glass is first sand-blasted and then coated with glue, after which the lights are placed in the oven. The heat of the oven cracks the glue, and it curls up, carrying with it minute slivers of the glass. After being well cleaned of the adhering glue and the semi-detached particles of glass, the effect is practically that of chipped glass, and very pleasing.

Shotguns for Our Aviators

(Concluded from page 107)

The cartridge contained $1\frac{1}{4}$ drama of bulk shotgun smokeless and 12 No. 1 Buck, or one ounce. The muzzle velocity was probably about 1,300 feet per second. At 90 feet—using a choke bore gun—eleven shots out of the twelve hit the man-sized figure, the eleven grouping amidstships and close together. They would have meant instant death, as is quite clear from the photograph. At 150 feet, seven pellets out of the 12 hit the figure, which included only the body from the waist up, with the head and neck outline. At 300 feet, because of the difficulty of aiming straight enough to center the load at this range, the greater part of the pellets went to the left, and the first load missed the figure. The second and third loads hit the figure with two shots each, enough instantly to knock out the victim. At this distance the buckshot galloped through $1\frac{1}{2}$ inches of redwood, ordinarily an ample penetration.

At the 90 feet range the gun threw a cloud of shot about eighteen inches across, barring the one wild pellet. At 150 feet the spread was about five feet, and at 300 feet ten or twelve. Beyond 100 yards the spread of the load was too great to ensure hitting, although it was still extremely dangerous for such a mark as an airship with two men and the delicate parts of the craft. Under 100 yards a well aimed load of buckshot of the size used would be nearly certain to wing if not entirely to disable the pilot of the ship. The No. 1 Buck is just .30 caliber and weighs 40 grains.

Turning to the use of the shotgun brings up once more the question of using round ball in cases where great penetration and a knockout punch are desired. The writer has done much experimenting with round ball in the shotgun, and he is under the impression from these experiments that the huge round ball of 500 grains or more weight, and .70 caliber, would under certain conditions wreck an airplane or knock out the pilot more quickly than a whole stream of machine gun bullets. Five rapid shots from an automatic shotgun loaded with round ball, under 100 yards or so, would prove astonishingly effective, in view of the huge weight and the enormous blow delivered by such a bullet. While its energy is actually less than that of the rifle bullet, because of its great diameter and its tendency to flatten, it delivers its entire blow, where the rifle bullet merely whips through doing no more than bore a hole.

Bullets of special design, tried by the writer, gave surprising results, ten of them staying within a space less than that occupied by a man's body, the range being 100 yards. Nobody who has watched these missiles slam through heavy planks doubts their efficacy at short range.

France-England Airplane Postal Service

ACCORDING to the London daily press, it is learned from semi-official sources that an airplane postal service between France and England is to be realized in the near future. It is considered that a service of this kind would be of great value during the war, especially in view of the fact that the members of the Interallied Committee, sitting at Versailles, could in this way be put into rapid communication with the War Office and with the British Government. The idea of the project comes from the French authorities, who delegated M. Flavon to England to consult with the Air Board and arrange the preliminary matters. At the same time the director of the Postal Service was instructed to negotiate with the Post Office for the necessary agreements which were to be drawn up concerning the proposed airplane service. It is stated that the project is practically agreed upon.

The Spad Pursuit Biplane

(Concluded from page 107)

however, that the surface of the radiator is none too great for the eight-cylinder motor driving the propeller through reduction gearing. There are two exhaust pipes—one for each bank of four cylinders. The length of the pipes deadens somewhat the sound of the exhaust—a very good point.

The large unbalanced rudder is hinged to the triangular fin and to the fuselage which terminates in a vertical knife edge. The elevators are hinged to the stabilizer almost a foot forward of the rear end of the fuselage, thus allowing a great working angle to the rudder. The stabilizer is supported by a tube from the fuselage on each side.

The landing chassis is very simple, consisting of two pairs of struts, each forming an inverted V. At the apex of each V is a slot guiding the axle up and backward parallel to the rear struts. Shock absorbers are of the rubber cord type. A short skid near the tail completes the landing gear.

Following is a table of characteristics: Span, 26 feet, 3 inches; length 20 feet, 4 inches; chord, 4 feet, 7 inches; gap, 4 feet, one inch; wing area, 220 square feet.

Hot and Cold Water in the Farm Kitchen

(Concluded from page 109)

with a very little trouble and the stove attached. The stove will heat a tankful of cold water sufficiently hot for kitchen use in two or three hours. For ordinary use in the average kitchen the water may be kept hot for one-third of a cent per hour. On wash days or whenever an excessive amount of water is used more fuel will, of course, be required.

If cold water direct from the cistern is needed at the sink, it is only necessary to turn the three-way valve so that the pointer will be to the extreme right (the pointer is not found with the regular three-way valve, but is shown here for the sake of clear explanation).

If hot water is wanted at the sink (assuming that the boiler is full and properly heated), it is necessary merely to turn the three-way valve to the position with the pointer straight up, and pump. The cold water from the cistern is forced through the boiler feed pipe into the bottom of the boiler, forcing hot water out at the top of the boiler through the hot water pipe. If a gallon of cold water is pumped into the boiler a gallon of hot water will be delivered at the sink.

If hot water is wanted at the sink when it is not convenient to operate the pump, it is only necessary to turn the pointer of the three-way valve to the extreme left and open the air cock in the hot water pipe. The opening of this cock permits air to pass into the top of the boiler through the hot water pipe. Warm water from the bottom of the boiler will then flow through the feed pipe to the pump. The flow will continue until the water in the boiler is lowered to the level of the pump spout. As a rule one would seldom have occasion to draw water from the boiler in this way, since it would be necessary to pump a like amount of water into the boiler later. Further, in this method water is drawn from the bottom of the tank and consequently is not so hot as water at the top of the tank.

If it is desirable for any reason, as when leaving the house for several days in winter, to drain the boiler and pipes, it is necessary merely to turn the three-way valve to the extreme left and fasten the pump handle up, when the water will drain back into the cistern. The entire contents of boiler and pipes will drain out except that in the very lowest part of the boiler, which may be drained out through the drain-cock near the stove. Or, if it is desirable to drain only the pipes, this may be done by opening the air cock in the boiler feed pipe and lifting the pump handle as before.

In addition to the uses already mentioned this equipment can be used to supply a bath tub in an adjoining room or on the floor above, by attaching to the hot water pipe another pipe leading to the bath tub.

With the attachment made near the pump, the flow can be directed to the bath tub by proper valves.

This simple equipment is well within the reach of almost every farm home. The cost would be about as follows:

A "water-front" for a range costs about \$3.50. The kerosene heater shown costs \$15. Measured in terms of convenience, of steps saved, of satisfaction secured, the cost is negligible. Should a more complete water system be later installed all parts of this equipment could be used, so that nothing would be discarded.

A Steel Mule That Drives Like A Horse

(Concluded from page 109)

So effective is this device that the tractor can be stopped more quickly than horses, making the machine very safe in stony ground.

In operation the broad surface on the ground acts to the steel mule as snowshoes to a man in deep snow. It distributes the weight of the machine over so large a surface that the mule treads upon the ground with a step lighter than that of a man, while a horse would have to have boards at least ten inches by twelve clamped to his feet to equal it in this respect. Then again, on account of the wide spacing of the front wheels, the mule can pass over ordinary obstructions with greater ease and safety than the average tractor. The arrangement of wheels and crawler gives the machine the very efficient three-point ground support, so that no rocking or frame distortion can occur from work on uneven ground or rough roads. The fact that three points determine a plane is a familiar enough principle, but there are many of our readers to whom it will never have occurred to apply it to transportation over rough ground.

Nitrate for Farmers at Cost

AS a part of its program for stimulating agricultural production, the Federal Government announces through the Secretary of Agriculture the purchase of about 100,000 tons of nitrate of soda which will be sold to farmers at cost, farmers paying the freight charges from the port of arrival and the State fertilizer tag fee.

The nitrate probably will be used most largely by farmers in the Atlantic Coast States from Long Island to Florida, owing to the value of nitrates for such crops as truck, grain and cotton, and the greater cost of freight to Middle and Western States. The free-on-board price at ports will be \$75.50 a ton.

County agents and local committees are coöperating with the Department of Agriculture in the work of distributing the nitrate and will furnish farmers with application blanks and explanations of how to obtain the material. If the total of the applications exceeds the 100,000 tons available, the Government reserves the right to prorate the amount to individuals in smaller quantities.

None of the nitrate will be sold to dealers either directly or indirectly, according to the department, and each farmer in his application must agree not to resell any nitrate but to use it on his own farm. Applications must be signed and returned so as to reach the county agents or members of local committees by February 4th. The Government is making every effort to reach farmers who desire a part of this nitrate, but states that it will be impossible for the county agents or other persons to visit every individual farmer and urges all who desire to purchase nitrate to get in touch with their local county agent or a member of their local committee.

Trade Marks in Great Britain

THE question as to the registrability of word trade marks has been occupying the attention of the British Courts to a considerable extent, and in the decisions which have been handed down, a line has been drawn between the case where a manufacturer has used a mark for the purpose of distinguishing his own goods from those of other manufacturers and a case where the manufacturer advertises the mark as the name of an article which anybody has the right to sell. In the latter case it has been held that the courts will

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not look with favor on a publicity campaign by advertisement or otherwise to bring about the general use by the public of a registered trade mark as the name or general description of an article.

In the case of Williams' Ltd. for the registration of the word "Chocaroons" as a trade mark for a new sweetmeat, an opposition to the registration was filed on the ground that by the application for registration Williams' Ltd. were in fact endeavoring to create a monopoly in the sale of the new sweetmeat by their efforts to obtain the exclusive right to the use of the name by which the sweetmeat had become known. The application for registration was refused on appeal.

Under the new trade mark practice in Great Britain when the registration of a word trade mark is applied for as a fancy name to a known article, the name of the known article should be set forth, and when the word trade mark is to be used as a general trade mark for more than one article, this fact should be made known. This new practice may be extended to apply to word trade marks which have already been registered in Great Britain for Sub-section 2 of Section 7 of a bill now before Parliament provides that after four years a trade mark used as the name or general description of any article and not as denoting an article offered for sale by a particular manufacturer may be removed from the register by the court on the application of any person aggrieved.

The Chemistry of War

THE general public has had intermittent news which has served to give to it some idea of the importance of chemistry in war work. Much has been said in a general way about gas and gas masks, about fighting with flame and about hiding vessels with smoke. These have however been merely straws that indicate an intense activity, the real story of which can not be written until the struggle is over. There are some general facts, however, that are not anybody's secret, which may be instanced to show wherein lies the importance of chemistry.

One naturally looks at once to the explosives, a purely chemical study, for an example of chemical research, for they supply the tremendous and attention-compelling feature of battle, but these, important as they are, find their peers in half-a-dozen other directions. Metallurgy and metallography are to the fore in the determination of the materials to withstand the tremendous rending force of the powder when fired, and come again into most important consequence in materials for cartridge cases and shells, which demand strength combined with lightness and with flexibility to manufacturing processes.

Then again the question of materials in general is important, first from the extraordinary demand, and next from the unusual wear to which articles will be subjected. Then there is the need for substitutes either to reinforce an insufficient supply or to afford a more economical material. While war is apparently heedless of costs, there are limiting factors, and the Zeppelin at half-a-million to a million dollars for construction, the airplane which in its droves demands vast sums for construction, the auto and the myriad smaller items, to say nothing of the artillery and small arms with their accessories, all are insistent on the production of material with economy. Thus it is that rubber becomes of enormous consequence, and the chemistry of rubber may well be one of the factors that will help to determine the supremacy of nations.

One looks upon the airplane as an exceedingly complicated bit of machinery, yet in truth, the importance of the machinery may be only about equivalent to that of the chemistry. It is a device working in a novel and comparatively unknown medium, the air. Variations in temperature, humidities ranging from dry almost to saturation are to be encountered, great strains demand strength, great speeds demand a minimum of friction, possibility of flight at all demands lightness, while the motor seeks a fuel which can pack thermal units into the smallest space and least

weight. The fabrics are a study in themselves and their treatment to make them waterproof, strainproof and shrinkproof is another; and then simple little things like the aviators' spectacles rise to importance. The dimming of these glasses may mean the loss of a life, and a new and unusual factor of safety is particularly urgent in the eyes of the gas masks that every soldier may be obliged to employ. Here chemistry seeks to replace glass with some other translucent medium. Work along this line is among the many items in which Technology men are interested.

The story of chemical agency in war must include all the refinements of the chemical laboratory in the production of gas antidotes, and these must provide for future discoveries in harmful gases as well as those existing, and furnish in advance their antidotes. Just how much has been done it is not possible to say, but it is a work into which America has gone heartily. Other obvious chemical agencies will be notable in flame throwers and their antidotes, incendiary bombs, signal smokes reverting in modern fashion to the methods of the Indians, signal flares and smoke barrages. In every item chemistry is busily at work and in unexpected places it crops out in most helpful ways, as for example, in the production of the hydrogen for balloons. The establishment of a great gas works near the firing front would be out of the question if it were to be along the lines necessary but a few years ago. The reduction of space and apparatus requirements makes the observation balloon an important adjunct in watching the enemy.

This very important work has had in the army heretofore no adequate direction. Other branches of the service, medicine, engineering, ordnance or supplies, has had each one its special organization. In Europe the warring nations have long since found the necessity of an organization of the chemical factors and in England and France, since a Gas Service was of necessity demanded early in the war, the chemical activities have grown up around it. In this country, however, we are practically at the beginning of warlike activities, and to meet the obvious needs, there has been organized the Chemical Service Section of the National Army with Col. Charles L. Potter at its head.

Colonel Potter selected Prof. William H. Walker of Massachusetts Institute of Technology to be his right hand man, with the rank of Lieutenant Colonel; and in the work or organization, Dr. Walker immediately sought a man to be his chief chemical aid and was fortunate enough to secure Dr. Raymond F. Bacon, director of the Mellon Institute of Pittsburgh, who has been appointed Lieutenant Colonel in the Section. Dr. Bacon is to be dispatched to France where he will be with General Pershing, while Dr. Walker will himself undertake the correlation and focussing on war essentials of the enormous resources of American chemistry.

Invisible Microbes Cure Dysentery

A BIOLOGICAL question of considerable importance was brought up before the Académie des Sciences at a recent meeting. Dr. Roux, the well-known Director of the Pasteur Institute, presented a paper by M. D'Herelle concerning the possible existence of invisible microbes which pass through the finest filters and appear to have a favorable action in the case of certain maladies of a microbial origin. He started with fecal matter from dysenteric patients and succeeded in separating the present microbes or substances. After filtering several times, he finally obtains a clear liquid containing the bodies in question, and this he finds to have a very active effect. Taking a certain quantity of Shiga bacillus, which is known to cause a certain form of dysentery, he treats these with his preparation and finds that the bacillus is destroyed in all cases. Then he makes inoculations first with the Shiga bacillus and then with the new preparation and finds that the result is neutral, and no infection is produced. The destructive action is very evident here, and that the new substance, whether it consist of invisible microbes or of other bodies, will be quite valuable in curing the above-mentioned disease.



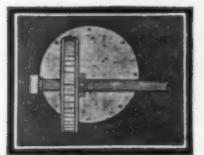
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Drafting-Room Junk for the Red Cross

AMERICAN manufacturers, architects, and all draftsmen are called upon to render an important service to their country. When the workman has finished with the piece of cotton or linen cloth used in his trade, it is flung aside to be destroyed. The Red Cross is asking now for that discarded material. All over the country thousands of women are earnestly engaged in the manufacture of surgical dressings to be used in the hospitals for our wounded soldiers and sailors. The problem of getting enough white goods for this work is enormous. As long as the war goes on the work must go on if we are to live up to the humanitarian ideals typified to the world today by the Red Cross. It is suggested that the laundries might appropriately take charge of the collection and preparation of this material for the Red Cross, and to this end the following technical details are set forth.

Some of the tracing cloth is thin linen fabric and some is thin cotton, but whether it is linen or cotton makes no difference in the washing process. The cloth has been treated with a gelatinous dressing, to make the material take ink, and at the same time be transparent. The dressing seems to resemble starch that has been ironed in the goods, in that it is softened by water, but does not completely dissolve and come out and leave no trace of stiffness in the goods. As the goods are to be used as surgical dressings, it is desirable that no starch remain and that the goods be as soft as possible. This end is best attained by the use of malt extract, or diastase, which is an inexpensive starch solvent. A short breakdown of malt extract, which is familiar under manufacturers' trade names, at a low temperature, will remove most of the drawing ink and at the same time take out all of the dressing that is in the tracing cloth. Those who have not the malt extract at hand will be able to do this work by use of a cold rinse, followed by a hot suds, but the goods will not be as soft as when the malt extract is used. The goods should be given a fairly strong bleach, followed by a sour, to remove the trace of bleach that may remain. Then there should be a good rinse, to remove every trace of the sour. The bleach will completely sterilize the goods; hence a boil is not necessary.

The goods should be extracted as usual, after which the material should be put through the drying tumbler, if one is available, as then the pieces will be soft and pliable. If a drying tumbler is not available, the pieces may be put through the flat work ironer. If it should happen that some drawing ink remains on a piece it should be put aside and laundered again with another lot of white goods. Tests have indicated, however, that ink comes out almost entirely with the wash and the bleach.

The greatness of the demand for old linen and cotton cloth, is being measured up to by the willingness of the laundries to take over this work. Be sure then, to notify them if you have any of this much needed material. Your promptness to respond to this call may, in sober earnest, become a matter of life or death to some of our wounded men across the sea.

Improving the Tonal Quantity of the Phonograph

IT is surprising that the average phonograph owner knows so little about his machine. As a general thing his knowledge extends to the limit of winding the motor, placing a record on the turn table, and placing the stylus in the first groove that happens to be handy. The result is that many phonographs do not possess the tonal qualities which the manufacturer intended, because the conditions of use are far from ideal.

Much can be done in the way of improving the tonal qualities of the steel-stylus type of phonograph, in contradistinction to the jewelled reproducer type where the conditions are more or less permanently fixed. To begin with, the user should exercise great care in the matter of needles. There are many varieties of steel needles on the

market today, and it will handsomely repay the phonograph owner to experiment with each of them until he finds the one which gives the best results with his particular machine. Of the usual four grades of each brand, soft, medium, loud and extra loud, the last should be avoided as much as possible, for the heavy steel point is most injurious to the record grooves. Particularly in the case of soprano records and loud band records is the extra heavy needle dangerous, for it rips the grooves until the ragged edge produces an unpleasant buzz or shriek. Of course, where a large room is to be filled with the sound and where the owner does not mind ruining a record after it has been played a few times, the extra loud needle is quite the proper thing to use.

The gritty sound which at times is most objectionable is due to many causes centering on the record itself. The record may be faulty in the first place, due to some flaw in the manufacturing process; or it may be badly worn. In either case the condition may be somewhat improved, although usually not altogether eliminated. There is available a certain Japanese preparation or oil which possesses a peculiar property as regards disk records. When applied to scratchy records it improves them considerably by re-glazing the ragged surface. Another method of improving phonograph records is to place them in a pan of gasoline for eight hours. This method, it appears, also tends to re-glaze the worn surface. Under no circumstances however, should soap and water be used on records with the idea of cleaning them.

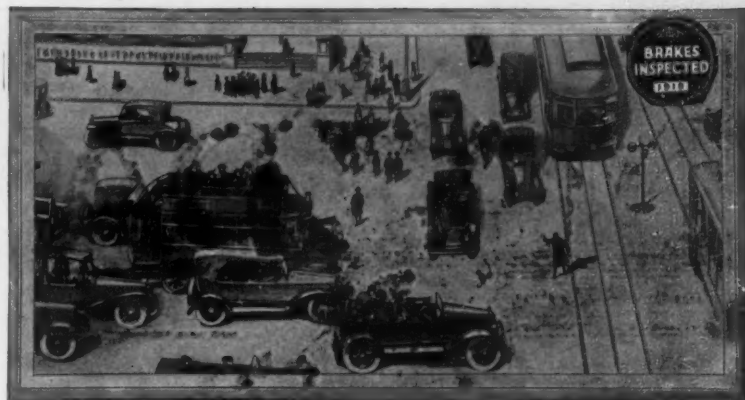
Dust is highly detrimental to clear reproduction. It is good practice to use a record cleaner on a record both before and after it has been played, and to keep records in an album or in envelopes. Under no circumstances should records be piled one above the other, without paper between.

Of late there has appeared on the market a cactus-thorn needle which, when tried out against all manner of steel needles, appears to give the purest sound with the least volume of scratch. Indeed, a cactus needle if used in its full length will play an otherwise scratchy record without any evidence of scratch unless the ear is placed close to the horn. Of course, under such circumstances the volume of sound is also reduced considerably, but by cutting off some of the stem of the stylus it is possible to compromise between the volume of sound desired and the permissible amount of scratch. Incidentally, the cactus needle will play 25 or more records without change, and when the sound becomes somewhat muffled one has but to sharpen the point with a hand file to renew it. All in all, the fiber needle, no matter what variety it may be, is the most satisfactory stylus for lateral-cut records where loudness is not a prerequisite.

Forcing a River to Dive

A NOVEL piece of engineering has recently been completed in connection with the building of an aviation field in England. The site selected was a pleasant piece of countryside, consisting of a wooded park, bisected by a little stream about 30 feet wide and 2 feet deep. This waterway is largely artificial in character. It was constructed mainly along a branch of the River Colne in 1638 and 1639, between Longford and Hampton Court Palace, with the object of supplying the Palace with ornamental fish and water ponds and it is used for this purpose up to the present time. It is 11 miles long.

The decision to convert the park into an aerodrome made it necessary to divert this river, which, being raised above the level of the ground where it crosses the park, presented an obstacle as well as a danger. Had the river been running in a natural bed below the level of the ground, instead of in an artificial channel above the ground level, it could have been merely covered over. The need for putting it at a lower level led to the decision to carry it underground through the aerodrome by means of a reinforced concrete inverted syphon, and this plan having been approved of a detailed scheme was got out.



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Your brakes have always worked and you grow careless of them. They are out of sight and you neglect to inspect them.

But do you ever stop to realize that the safety of your car and its occupants depends absolutely on the efficiency of your brakes? That lack of brake inspection, carried just one day too far, has caused more fatal accidents and the loss of more motor cars than any other source of danger with which the motorist must contend?

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To have brakes always efficient is as easy as it is necessary.

Ask your garage man to inspect them regularly.

If they need relining do not buy just "brake lining"—your safety is too important for that. Thermoid Brake Lining will give you consistently efficient service because of its scientific construction. In its process of manufacture it has three exclusive features.

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cause brake lining to swell and grab, a source of danger and trouble.

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The conduit is 1,055 feet long, but in addition to the covered in portion, there is a retaining wall and river diversion beyond which makes the total length of the work just a quarter of a mile.

It was decided, in order to facilitate the cleaning out of the underground channel, to have a double syphon. The gradient adopted in laying it is one in 2,000. It is designed for a flow of 27,000,000 gallons in 24 hours, and a small waste weir has been provided above the intake to carry away any surplus water. The ground being nearly all gravel, the excavation was comparatively easy, and the operations which were started at the end of May, 1917, were completed in five months. The only difficulty that occurred arose from the very heavy rainfall at the end of July, when nearly five inches of rain fell in four days, flooding the trench and rendering necessary the installation of additional pumping machinery. As only one section of the culvert will be closed at a time for cleaning purposes, it was necessary to provide only one penstock at each end, and thus considerably reduce the cost of the work. A drainage ditch has been provided for use when it is necessary to empty one of the conduit sections, the waste water running away into the Thames.

New Vaccine to Increase Efficiency of the Army

CONSIDERABLE progress is realized by the new method of vaccination against typhus which is coming into use in the French Army. It will be less disagreeable for the soldiers, and for reasons which will be seen, it actually increases the combative value of the army. This new discovery is the *lipo-vaccine*, as it is called, and it was made by M. Le Moignie, a member of the Naval medical force. Vaccination for typhus was made obligatory a short time before the war and has been applied in practice to the troops from the end of 1914 to the present time. By the effect of the first vaccinations, the monthly death rate which was then 100 per 100,000 men (for a slight epidemic had started), was quickly reduced at first, being then followed by a gradual diminution which has not yet stopped, so that for the first few months of 1917 the rate is below one per 100,000 men. This is an excellent result, and the saving of life is the equivalent of a great number of fighting men. As to the vaccines employed, these were usually the excellent Vincent of Chantemesse vaccines. Experience shows that in order to give the soldier a sufficient immunity, it is required to make an injection of about two billions of each of the three typhus bacilli properly prepared. But, of course, this seemingly large figure signifies nothing when compared to our organism. However, it is true that if this total amount were injected at once it would be dangerous for life, so that the system must absorb it by several successive injections, spaced a few days, in order that he may recover from the effects in the interval, these effects being somewhat disagreeable if not serious, and often accompanied by fevers and bad feeling. But in order to keep up the immunity, vaccination must also be made once a year and hence these multiple injections laid up a good fraction of the army, and other difficulties arose from the fact that between two injections the troops might be called to another place. Dr. Le Moignie sought for a vaccine which would act by one operation and without discomfort, and succeeded in finding what he calls *lipo-vaccine*, from the fact that it contains oily matter. Formerly the microbes were suspended in water, and the author showed that this is precisely the cause of the bad effects produced, because of the rapid diffusion of the water in the tissues, while in the present case the microbes are contained in certain oils which give them up to the blood at a slow rate. The result is that the entire dose can be used in one operation, and there is less discomfort than even in one of the former injections. It is already known that oily substances will cause a slower action of toxic substances, for instance if strychnine is dissolved in oil, a dog will support six times the fatal dose where water is employed.

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Notes
and Queries.Kindly keep your queries on separate sheets of
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patents, subscriptions, books, etc. This will
greatly facilitate answering your questions, as in
many cases they have to be referred to experts.
The full name and address should be given on
every sheet. No attention will be paid to un-
signed queries. Full hints to correspondents are
printed from time to time and will be mailed on
request.(14265) R. C. P. asks: Whereas we are
reasonably familiar with the ordinary compounds
that fall under that branch of chemistry known
as inorganic, also with the more common ones
which are listed as organic, we would like to get
concise definitions of *inorganic* and *organic*
chemistry. A. The term "Organic" was applied
long ago to include those chemical substances
which were supposed to be incapable of formation
excepting by organized beings, living animals or
plants, because of their vital force. Now that
many of these substances have been built up
synthetically the term has lost this significance
and is used simply to indicate the carbon com-
pounds, whether from plants and animals or not.
Inorganic chemistry covers all other compounds.(14266) W. B. asks: 1. Please explain
fully the mechanical principle discovered by Nikola
Tesla, which enables the production of
prime movers capable of developing 10 horse-
power or even more for each pound of weight, and
describe its applications. 2. Who invented the
"mazda" electric lamp? 3. Is there any pos-
sibility of utilizing, as Franklin thought, the elec-
tricity of the clouds? If so please tell of any
steps in that direction and the processes used.
1. We are not able to explain the mechanical
principle which enables 10 horse-power to be
derived from a motor for each pound of its weight.
The best airplane motors are far from producing
power at such a rate. If it had been done the
aviation problem would not be so difficult as it is.
2. The Mazda lamp is controlled by the General
Electric Company. The statement of this com-
pany is that Mazda is "Not the name of a thing,
but mark of a service." It is however applied
by the public chiefly to the lamp which
has a drawn-wire tungsten filament. The draw-
ing of tungsten into a wire was worked out by the
Research Laboratories of the great electric com-
panies. We are not able to give the names of
the experts who achieved this result. It has,
however, revolutionized electric lighting. 3. We
cannot pronounce upon the possibility of drawing
electricity from the clouds for practical uses. We
can say that it has not been accomplished. A
well-known tower which was supposed to have
been built for experiments in this direction has
recently been blown up by the U. S. Government
to prevent its use for wireless purposes by enemies.(14267) H. H. asks: What acid or fluid
will remove iron rust and do it quickly without
rubbing the iron? Thanking you in advance, I
wish to see this in the Notes and Queries of the
SCIENTIFIC AMERICAN. A. Kerosene oil seems
to start the rust on iron very well, but we do not
know anything which will remove rust without
rubbing. There are many pickles for iron and
steel given in our Encyclopedia of Formulas, a most
valuable collection of 15,000 receipts, covering
every field of work, which we will send for \$5 by
mail postpaid.(14268) C. W. S. asks: 1. I wish to
study up the electrolysis of water, kindly give me
the numbers of your papers which treat on the
subject. I wish to use a dynamo operated by
hand, what is the voltage etc. best to use. 2.
Would a plating dynamo be satisfactory. 3.
What is the hydrogen made from that is used
with oxygen for stereopticons. 4. What per cent
of sulfuric acid is used in the water to be de-
composed. 5. Where can I get the apparatus for
decomposing water in Chicago. A. 1. Three
volts or less are used in the commercial elec-
trolysis of water, but more than 1.40 volts, since
this is the electromotive force of polarization of
hydrogen between hydrogen and oxygen. Hydro-
gen is positive to oxygen and its affinity for oxy-
gen is represented by an electromotive force of
1.49 volts. Of course any voltage greater than
3 volts may be used but such a voltage is unnec-
essary. With 3 volts, 100,000 coulombs evolve
1.04 grams, 11.6 liters of hydrogen at 0° C. and
normal pressure, and 8.5 grams, 5.6 litres of oxy-
gen. Under these conditions the production of
one cubic meter of hydrogen and half as much oxy-
gen will require 7 kw.-hrs. 2. A plating dynamo
is well adapted to the electrolytic production of
hydrogen and oxygen. 3. Hydrogen is not
usually employed in the calcium light for stereo-
opticons. Street gas is used. It answers the
purpose and is much cheaper. If hydrogen is
used it is made by the action of hydrochloric or
sulfuric acid upon zinc. 4. A 20 per cent solu-
tion of sulfuric acid, or a 15 per cent solution of
caustic soda is used for the electrolysis of water.
These concentrations correspond to the maximum
conductivity of the solutions. For the acid
solution lead electrodes are used, and iron is used
for the alkaline solution. Platinum is used for
electrodes in laboratory experiments, in which
case 1.7 is the least voltage. 5. You can obtain
the apparatus from the dealers in physical ap-
paratus in your city. Their addresses may be
found in a business directory. We have not pub-
lished these matters in our papers. They may be
found in the Electrical Engineer's Pocket Books.
We can send the Standard for \$5 by mail.Patents
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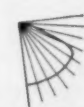
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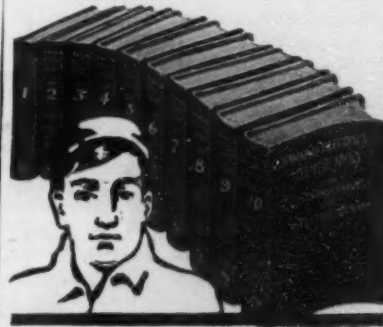
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NEW BOOKS, ETC.

PRINCIPLES OF NATURAL PHILOSOPHY. By F. J. B. Cordeiro. New York: Spon & Chamberlain, 1917. 8vo.; 113 pp.; illustrated. Price, \$2.50 net.

The author makes a strong plea for mathematical exactness in thought and for a more general acquaintance with the calculus as a means to that end. He argues that it is our knowledge of nature and natural forces which determines our present and future civilization—which statement, although it savors of "kultur" in ignoring the essentially ethical basis of true civilization—has much truth in it. The reference to the calculus will warn the acute that this is no elementary text, "overflowing of problems concerning rods and strings and flies walking on circular wires," but is a very solid attempt to set forth the hidden forces of the universe by the free use of mathematics; those who are equipped to follow the writer's close reasoning will be well repaid for their trouble; he presses his investigations to the borderland of the ultimate cause, and in so doing illuminates fundamental laws and principles, elucidates problems such as are presented by the tides and attractive and molecular rigidity, and concludes with a note on the cause of gravitation.

NON-TECHNICAL CHATS ON IRON AND STEEL. And their Application to Modern Industry. By LaVerne W. Spring, A.B. New York: Frederick A. Stokes Company, 1917. 8vo.; 368 pp.; 295 illustrations. Price, \$2.50 net.

Those who deem this a dry subject would do well to read the first chapter of the work, on the early history of iron; it is safe to say that they will not stop until they have heard what the author has to say of cast and wrought iron and the various steels, and of the spectacular processes that bring them to perfection. So far have certain treatments now been carried that steel pipe may be tied into bowknots, steel plate may be folded, cold, and folded again, seamless tubing may be crushed endwise into a mass of wrinkles, and all without developing a single crack in the material. The abundant and well-selected illustrations show these marvels, and also both ancient and modern plants, furnaces and processes, from the primitive smelter of early man to the great cranes and soaking pits of the mammoth structures of today. In reading Mr. Spring's inspired narrative the steel mill assumes a personality of its own, and the knowledge he has acquired by long experience is fused into an adventurous, even romantic story in which entertainment and instruction are exceedingly well balanced.

DOUBLEDAY, PAGE & CO'S GEOGRAPHICAL MANUAL AND NEW ATLAS. By C. O. Sylvester Mawson, Litt.D., Ph.D. Garden City: Doubleday, Page & Company, 1917. 4to.; 412 pp. Price, \$4.50 net.

The publication of this work must be regarded as an event of importance in the educational field. The experience and standing of its author guarantees not only the inclusion of all the most significant and useful geographical facts, but also their presentation in an orderly, lucid and efficient manner. The only objection to such a work at this particular time is that after-war adjustments may make obsolete many of the beautiful maps; but this objection is met by the promise of the publishers to furnish, free, new maps showing all changes, when the new boundary lines shall have been determined; hence the work lives up to its claim of being an atlas "of today and tomorrow." It is, indeed, not merely an atlas, but a complete geographical reference manual, and fills a distinct need unsatisfied by any existing work. Striking episodes of African, Arctic and Antarctic exploration are told in the words of the original discoverers, thus imparting vitality to what is usually a drily-handled subject. There are fine maps of the battle fronts, with the pronunciation of war names; automobile maps of America; maps of ancient Greece and Rome and other vanished kingdoms; and a dictionary of animal and mineral commodities giving varieties and sources of supply. The binding and typography is artistic and dignified, and the accuracy and lucidity of the abundant information should commend the work to all who wish to keep abreast of geographical knowledge.

THOMAS' REGISTER OF AMERICAN MANUFACTURERS. And First Hands in All Lines. New York: Thomas Publishing Company, 1917. 4to.; 3,900 pp. Price, \$15.

Should a business firm line the walls of a room with filing cabinets, and fill every cabinet with cards, the probability is that this fund of information would fall far short of that contained in the single volume of Thomas' Register. First we come to the yellow pages containing the finding list and index; then the body of the work, on white paper, consisting of lists of manufacturers classified according to business; following this section is another, this time with the manufacturers arranged alphabetically by name, and giving the home offices, branches, names of officers, sales managers and purchasing agents, together with much other information including the rating of the firms; this is on blue paper; the fourth section is composed of leading trade names, brands, etc., and the pages are pink; the imposing array of reference material is concluded by an appendix, on white pages, listing banks, boards of trade and other commercial organizations, trade papers, manufacturers' representatives, etc. It will be apparent that this use of different-colored paper is a great aid in quickly finding any desired item. The location of any firm may be found by the alphabetical blue list; if the trade name of an article is known, the manufacturer may be ascertained by a reference to the pink pages; if "Who succeeded the Brown Manufacturing

Company?" is the question, the successors will be found under the old name; supposing it to be necessary to find the names of manufacturers of electrical goods of all kinds, after the word "Electrical" in the yellow index is shown the columns in which these firms are listed. This mammoth work is amazingly complete, and buyers and sellers, from Government departments and railroads down to the small merchant and manufacturer, will come to regard it as an indispensable aid to economy and efficiency.

A SOLDIER'S GUIDE. By James M. Hutchinson, Lieut.-Col. 71st New York Regiment. New York: National Military Publishing Co., 1917. 16mo.; 256 pp.; illustrated. Price, \$1.25 net.

In this "handbook of intimate counsel and advice," a veteran officer gives a straight talk to the recruit. The duties and relaxations of camp life are narrated in such a way as to be directly helpful in the performance of the one and the enjoyment of the other. The soldier is taught how to take care of himself morally and physically, so that his appearance and his efficiency may bring credit to his regiment and self-respect and comfort to the man himself; he is shown also how to look after that best of all friends, his rifle. The drill regulations, marching, marksmanship, sanitation, trench warfare, obedience—these are some of the subjects inspiringly handled. There are pages for identification data and blank leaves for notes; the work is of convenient size for the pocket, is written around that almost perfect admonition, "Fear God, honor the flag, shoot straight, and keep clean," and makes an excellent gift for the man in camp or in the field.

THE PRISON AND THE PRISONER. A Symposium. Edited by Julia K. Jaffray. Boston: Little, Brown, & Company, 1917. 8vo.; 230 pp. Price, \$2.50 net.

The fact that from 50 to 90 per cent of our prison inmates are old offenders indicates that our methods of correction are not a deterrent to crime. For seven years the National Committee on Prisons and Prison Labor has studied the problems of penology at first hand; the results are displayed in this excellent symposium, where judges, physicians, social workers and prison officers present each that portion of the problem which has come directly under their observation. Shorn of all sentiment, the question seems to be: What sort of being shall we loose upon the world from our prisons? wretches that maltreatment has confirmed in physical and mental depravity, though a single mistake may have delivered them into the clutches of the law, and who burn with a sense of wrong that makes them declare war on the society responsible for it, or men physically sound and mentally disciplined, trained to some bread-winning occupation, and followed out of prison by an interest that sees them established in life before it leaves them to fend for themselves? Is this latter consummation possible? To a great extent, yes. Read here the experiences and experiments of such men as Thomas Mott Osborne, Judge Wadhams, and others who have scientifically and collectively attacked this momentous problem; their findings are readily set forth, to be interestingly followed by any man who has the welfare of the community at heart.

HOW TO MAKE CONCRETE GARDEN FURNITURE AND ACCESSORIES. Edited by John T. Falcoun. New York: Robert M. McBride & Co., 1917. 4to.; 119 pp.; illustrated. Price, \$1.50 net.

Cool concrete, skilfully modeled and tastefully placed, adds much to the beauty and utility of the garden. This handbook contains specific and very thorough instructions for making walls, steps, fences and copings; for putting in swimming pools and molding benches and sun-dials; and for making such minor accessories as bird baths, lanterns and pottery. The work begins at the beginning—with the selection and testing of material; much consideration is given to proper proportioning and mixing, and the making of forms and placing of the concrete is described so carefully that the tyro cannot plead ignorance as excuse for failure. The accompanying illustrations show some artistic arrangements and suggest innumerable adaptations.

TRADE-MARK ADVERTISING AS AN INVESTMENT. By Arthur Acheson. New York: The New York Evening Post, 1917. 8vo.; 46 pp.

The writer has here brought together material which has proved successful in soliciting business from advertisers. Starting with the principle that "the message is the thing," the advertiser is urged to ask himself not "What have I put into this advertisement?" but "What will the average reader get out of it?" The work goes on to discuss the capital value of the trade-mark, repetition and the element of time, and vision. By vision is meant the outlook and the faith of the man whose money is expended.

PRODUCTIVE PLANT HUSBANDRY. A text book for High Schools. By Kary Cadmus Davis, Ph.D. Philadelphia: J. B. Lippincott Company, 1917. 8vo.; 478 pp.; 312 illustrations. Price, \$1.75 net.

With more than 4,600 of our high schools offering some kind of agricultural course, this text should find its sphere of usefulness; for it is the outgrowth of conference discussions and plans, and provides a very thorough and moderately elastic series of lessons. By leaving animal husbandry for a second year course, time and space is gained for a more complete treatment of plant propagation and breeding, soils, field crops, gardening, fruits growing, forestry, pests and diseases, and farm management. The book is well-conceived and well-written, with hundreds of illustrations that brighten and strengthen the text.

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You bet-your-bonnet Prince Albert wins in a walk!

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Go to P. A. like a streak of greased lightning! If you're long-on-a-pipe or a makin's cigarette smoke that *will* shift-your-sentiments, come on board and get down to business! *For, the whistle's blowing!*

You'll want to call-a-cab and spread this P. A. smokenews! You'll uncork first-hand

reports that Prince Albert can't bite your tongue or parch your throat because our exclusive patented process *cuts out* bite and parch!

You'll make-merry-music because Prince Albert's flavor is so distinctively delightful and refreshing, *and more-ish!* You'll like enough want to eat it, it's so appetizing; and, so *friendly!* Why, you'd stuff-a-ballot-box full of votes if P. A. ran for King-of-Happiness!

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For, P. A. is a smokerevelation any way you hook it up to a match—jimmy pipe or home-rolled cigarette! It has brought thousands of tender-tongued men back to the

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No matter to what smokeregiment or branch of the smokeservice you belong, Prince Albert will put such a new shine on your smokeappetite you'll feel like it's Washington's Birthday every time you blaze-a-match!

Prince Albert awaits your word everywhere tobacco is sold. Tippy red bags, tidy red tins, handsome full pound and full half-pound tin humidors—and—that clever, practical full pound crystal-glass humidor with sponge-moistener top that keeps the tobacco in such perfect condition.

R. J. REYNOLDS TOBACCO COMPANY, Winston-Salem, N. C.

MURAD

THE TURKISH CIGARETTE

FAGS

By Corporal Jack Turner

What tobacco really means to a soldier has been voiced in more poetry—good, bad and indifferent, but always heart-felt—than almost any other subject of the war. Here is a poem from the British army which became so popular abroad that it has been reprinted and widely distributed:

When the cold is making ice cream of the marrow of your bones,
When you're shaking like a jelly and your feet are dead as stones,
When your clothes and boots and blankets, and your rifle and your kit,
Are soaked from Hell to Breakfast, and the dugout where you sit
Is leaking like a basket, and upon the muddy floor
The water lies in filthy pools, six inches deep or more;
Tho' life seems cold and mis'erable and all the world is wet,
You'll always get thro' somehow if you've got a cigarette.

When you're lying in a listening post 'way out beyond the wire,
While a blasted Hun, behind a gun, is doing rapid fire;
When the bullets whine above your head, and sputter on the ground,
When your eyes are strained for every move, your ears for every sound—
You'd bet your life a Hun patrol is prowling somewhere near;
A shiver runs along your spine that's very much like fear;
You'll stick it to the finish—but, I'll make a little bet,
You'd feel a whole lot better if you had a cigarette.

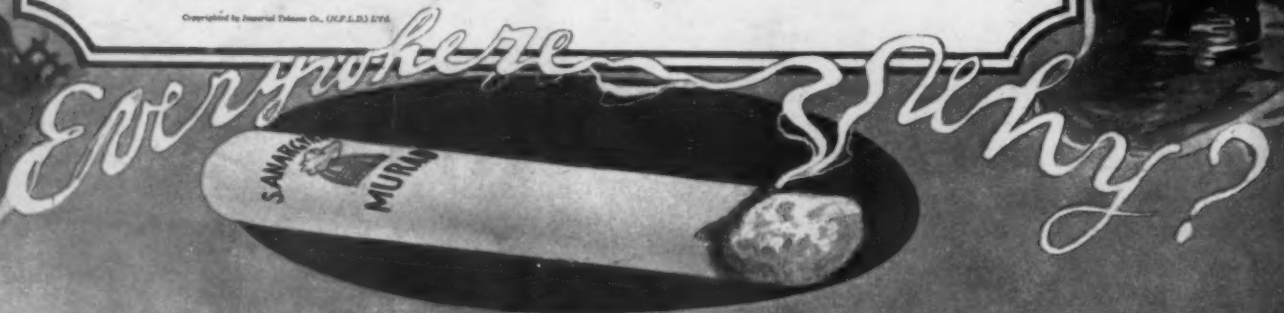
When Fritz is starting something and his guns are on the bust
When the parapet goes up in chunks, and settles down in dust,
When the roly-poly "rum-jar" comes a-wobbling thro' the air,
'Til it lands upon a dugout—and the dugout isn't there;
When the air is full of dust, and smoke, and scraps of steel, and noise
And you think you're booked for golden crowns and other Heavenly joys,
When your nerves are all a-tremble, and your brain is all a-fret—
It isn't half so hopeless if you've got a cigarette.

When you're waiting for the whistle and your foot is on the step,
You bluff yourself, it's lots of fun, and all the time you're hep
To the fact that you may stop one 'fore you've gone a dozen feet,
And you wonder what it feels like, and your thoughts are far from sweet;
Then you think about a little grave, with R. I. P. on top,
And you know you've got to go across—altho' you'd like to stop;
When your backbone's limp as water, and you're bathed in icy sweat,
Why, you'll feel a lot more cheerful if you puff your cigarette.

Then, when you stop a good one, and the stretcher bearers come
And patch you up with strings, and splints, and bandages, and gum;
When you think you've got a million wounds and fifty thousand breaks,
And your body's just a blasted sack packed full of pains and aches;
Then you feel you've reached the finish, and you're sure your number's up,
And you feel as weak as Belgian beer, and helpless as a pup—
But you know that you're not down and out, that life's worth living yet,
When some old war-wise Red Cross guy slips you a cigarette.

We can do without MacConachies, and Bully, and hard tack,
When Fritz's curtain fire keeps the ration parties back;
We can do without our greatcoats, and our socks, and shirts, and shoes,
We might almost—tho' I doubt it—get along without our booze;
We can do without "K. R. & O." and "Military Law,"
We can beat the ancient Israelites at making bricks, sans straw;
We can do without a lot of things and still win out, you bet,
But I'd hate to think of soldiering without a cigarette.

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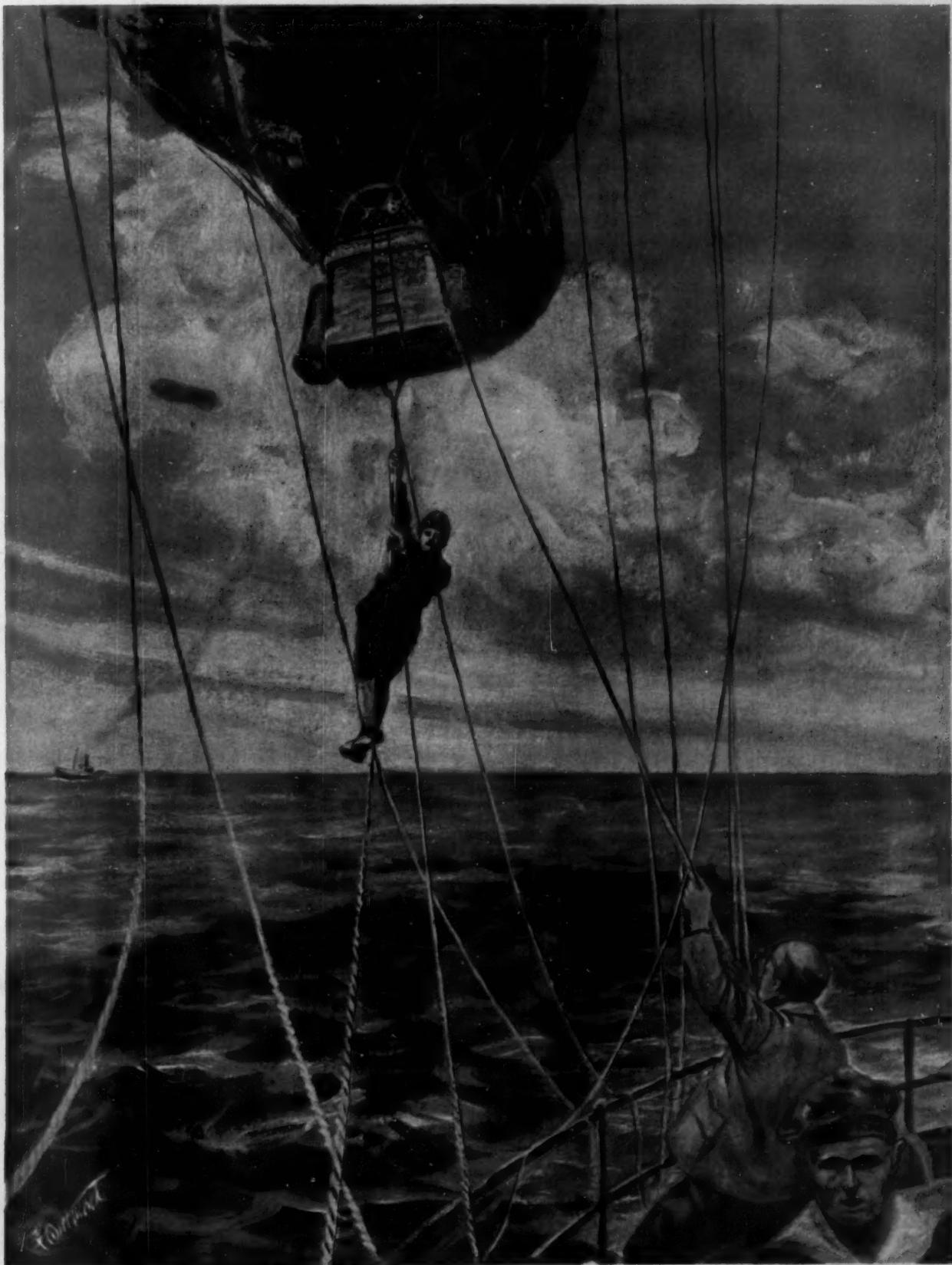
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A. S. BURLISON, Postmaster-General.

SCIENTIFIC AMERICAN



WITH THE KITE BALLOONS AT SEA: OBSERVER RETURNING TO THE TENDER [See page 129]



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First manufactured twenty years ago, the MACK introduced the motor truck idea in the United States. Years of practical experience have brought refinements of design and improvements in construction, till today the MACK is the most enduring performance truck on record. In Los Angeles, a MACK truck has traveled 50,000 miles with an actual cost for repairs and parts of less than \$20.00.

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